

**PROCEEDINGS OF THE AMERICAN ASSOCIATION OF
COLLEGES OF PHARMACY TEACHERS' SEMINAR**

VOLUME 12, PHARMACEUTICAL EDUCATION

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COLLEGES OF PHARMACY**

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PHARMACEUTICAL EDUCATION**

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BOULDER, COLORADO**

PREVIOUS TEACHERS' SEMINARS SPONSORED BY THE
AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY*

1. **Pharmacy**, School of Pharmacy, University of Wisconsin, 1949
2. **Pharmacy Administration**, College of Pharmacy, Ohio State University
1950
3. **Pharmacology**, School of Pharmacy, Purdue University, 1951
4. **Pharmaceutical Chemistry**, College of Pharmacy, University of Michigan,
1952
5. **Pharmacognosy**, College of Pharmacy, University of Utah, 1953
6. **Pharmaceutical Education**, School of Pharmacy, University of Connecticut,
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8. **Pharmacy Administration**, College of Pharmacy, University of Texas,
1956
9. **Pharmacology**, College of Pharmacy, University of Washington, 1957
10. **Pharmaceutical Chemistry**, College of Pharmacy, University of Minnesota,
1958
11. **Pharmacognosy**, College of Pharmacy, University of Illinois, 1959

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PROCEEDINGS OF THE TEACHERS' SEMINAR ON PHARMACEUTICAL EDUCATION

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PROCEEDINGS OF THE TEACHERS' SEMINAR ON PHARMACEUTICAL EDUCATION

BOULDER, COLORADO, 1960

HORIZONS IN PHARMACEUTICAL EDUCATION

PROLOGUE

GREETINGS FROM THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

CHARLES W. BLIVEN

This morning we shed our "business" clothes and don those of seminarians. While I have greeted many of you previously as official delegates or faculty members as we opened our business meeting, I greet you now as plain seminarians—I started to say *simple* seminarians, but some of you may not like my choice of adjectives, and I do wish to walk among friends the rest of the week. From now until 5 P.M. Friday, deans are no more significant than instructors, and, speaking for myself at least, I have as much need for the wisdom to be provided during the next four days as does any instructor.

The Seminar Committee has prepared an excellent program, one which should provide each of us with information we can apply to our particular programs. The total value which will accrue from the seminar, however, depends on what we do after we return to our respective colleges. Since it is not possible to have all 900 of our faculty members present, those in attendance must assume the responsibility of carrying the information and motivation you will obtain during the next few days to those who could not attend. As I have previously expressed it, you who are in attendance must provide the "cross-fertilization" so essential if each of our faculties is to receive the maximum benefit from this seminar.

As we begin our seminar, we start the second phase of our combined program wherein the annual business meeting and the general seminar are held together on a university campus. There is every reason to believe that this combined program will be successful and will become the pattern for each third year. On the two intervening years, as you will recall, the plan is to hold a seminar in a single discipline on a campus and the annual business meeting

during the week in which the A.Ph.A. meets. The various sections of teachers will be continued. They will meet during each of the general seminars but not during the two intervening years when the business meeting is held with the A.Ph.A.

As the program evolves during the next four days, any suggestions you may have about the new procedure will be appreciated. I say this because I have the task of summarizing the seminar and "crystal-balling" the seminars for the future. Perhaps, this new pattern is not the best. If this is your thinking, please do not hesitate to so indicate this to me *in writing*, stating your objections to this plan in addition to your suggestions for the future. On the other hand, if you like this pattern and wish to see it continued, I shall be happy to receive such expressions.

There is but one objective to such a combined program, namely, to reach as many faculty members as possible with information designed for the maximum strengthening of our individual educational programs and of pharmaceutical education as a whole. As we voted in Cincinnati last year, this pattern was accepted by the majority as being the means of achieving this objective. I think it was a wise decision then, but this does not mean that an even better plan is not possible.

There is one point I should like to stress, however. While under the existing pattern whereby each third year we will not meet with the A.Ph.A., we, as pharmaceutical educators, must continue to actively support the program of the parent organization. Through the years, major contributions have been made by our members and the fact that we do meet separately each third year must not diminish our contribution to the total program of the A.Ph.A.

As we begin another seminar, we should pay tribute to the American Foundation for Pharmaceutical Education, the organization which has made this meeting and the past eleven seminars possible. Certainly this is one recommendation of the Pharmaceutical Survey which has been implemented to the benefit of education and to the profession as a whole. The American Association of Colleges of Pharmacy is indeed grateful to the Foundation for its continued support of our seminar program as well as its support in other activities of our Association.

I am happy to have had the opportunity to bring these few words to you even though all of what I have said cannot be classified under the head of "greetings." However, during the next four days I hope to have the privilege of greeting each of you in person. In fact, if I might make a wish for each one in attendance it would be that each of you seek the same privilege, i.e., of greeting every person present at the seminar. I often recall a statement made by our late colleague, Dean Lyman. He said "I know of no group that has a better time than a group of pharmacists." Let us live up to this statement and gain through the friendship of fellow seminarians as well as from the wisdom of those who will be our teachers for the next four days.

It has been a privilege to bring you these words.

GREETINGS FROM THE AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION

W. PAUL BRIGGS

I am happy to greet you at the opening of this Twelfth AACP Teachers' Seminar and to bring best wishes from the Officers and Board of Directors of the American Foundation for Pharmaceutical Education. The Foundation views these seminar sessions as one of the most productive activities it shares with the American Association of Colleges of Pharmacy.

If the President's 1947 Commission on Higher Education was correct when it said:

College teaching is the only major learned profession for which there does not exist a well-defined program of preparation directed toward developing skills which it is essential for the practitioner to possess,

then your seminars are filling a vital purpose in the advancement of pharmaceutical education. The Foundation is anxious to do its part in helping to develop the maximum potential for effective teaching in pharmacy.

I am sure Professor John Diekhoff did not have pharmacy teachers in mind when he wrote:

The professor's calling, the calling he hears and heeds, is usually to scholarship, not teaching. He sees himself as historian, or physicist, or critic, or economist. For his biography in *Who's Who* he may call himself "educator," but he seldom sees himself and very seldom refers to himself as a "teacher." Indeed, he is likely to resent identification with teachers, for *teacher* is the title and occupation of those who toil in elementary schools and secondary schools rather than in colleges and universities. Only the youngest neophyte, the "teaching assistant" or "teaching fellow," has any form of the word *teach* in his college or university title. For everyone else there are euphemisms—lecturer, instructor, and the several grades of the more august term, *professor*, which is reserved for higher education, circuses, and medicine shows.

These are the prejudices of our trade, and any formal, any recognizable, attempt to improve college teaching must overcome them and related prejudices. They must be overcome because any attempt to improve college teaching must begin with the accepted assumption that teaching is an important part of the professor's calling.

Our great educational institutions are centers of both research and teaching. It is often quite difficult to tell where one function ends and the other begins. And I would not want to compare the relative importance of research and teaching as separate functions of a college of pharmacy. Happily this is not necessary. Furthermore, it appears that many good teachers do not engage in extensive research. Thus the Foundation commends the AACP and the dedicated members of your faculties for recognizing the prime importance of annual seminars to teach teachers.

I am sure these well-planned sessions will be rewarding to each seminarian and stimulating to all teachers in the fertile fields of pharmacy.

HORIZONS IN PHARMACEUTICAL EDUCATION

GEORGE L. WEBSTER

It is a stimulating experience to be privileged to speak so early on a program which in its later moments includes the best talent available and known to the Committee. My title is broad and it enables me to view the present educational scene and to look beyond it into the challenging distances. It gives me a duty to speak objectively but also an opportunity to comment upon what I see as it appears through the experience and prejudices which I have acquired in the past number of years.

The present time and circumstances are particularly promising for such a look at pharmaceutical education. Most of the colleges of pharmacy are just completing the last four years of a baccalaureate educational pattern which began, as a minimum requirement, twenty-eight years ago. This has been a sufficiently long period in which to experiment, test, and evaluate courses, curriculums, and results so that some reasoned judgments could be made.

In retrospect it can be said that the adoption of the baccalaureate curriculum as the minimum educational preparation for pharmacists was a major step forward. By this act the educators in the American Association of Colleges of Pharmacy signed a declaration of emancipation from the time-accustomed thinking of the tradesmen in the profession who have looked upon pharmacy largely as a side-line, essential as an excuse for keeping their merchandising establishments open for the long day but requiring only a variety of manual skills and a technical vocabulary for its practice. This type of pharmaceutical thinking has been fighting a determined battle against professional education since pharmaceuticals were a monopoly of the Guild of Grocers. It has not completely disappeared from the scene and many of us are plagued with the necessity of defending professional education against the attacks of those who exploit pharmacy but would prevent the nurture of the professionalism which is the source of their profits.

Whether events call forth leadership or whether leadership shapes events has been argued many times. Without attempting to resolve this dispute it can be pointed out that the victory of the proponents of the minimum baccalaureate degree for pharmacy coincided with the appearance of Prontosil, the first sulfa-drug, and what has been regarded by many as the harbinger of the present age of potent and specific drugs. Professional education in pharmacy had become a reality none too soon to cope with the rapid multiplication of new drugs.

The first curriculums which were fashioned for the baccalaureate degrees bear only modest relationships to those which are presently being concluded. Faculties in the more progressive colleges have repeatedly changed courses and emphasis. The AACP in conjunction with the A.Ph.A. and the NABP attempted to give guidance through the *Pharmaceutical Syllabus* with varying degrees of success. It can be said that by the middle of the 1940's most curriculums were strong in chemistry and in pharmaceutical technology. Botanical science and pharmacognosy were quantitatively heavy in many colleges but doubts as to the goals to be achieved by them were beginning to be felt. Animal biology was included in some curriculums as were physiology and pharmacology.

Physics, as a science basic to all practical applications, was not universally included in the curriculums, and sometimes when it was, it was not preceded by a suitable mathematics prerequisite. This, I believe, was due to the reluctance of some administrators and faculties to subject their students to the rigors of college physics for fear that thereby the population of their college would be diminished and retail pharmacy in their communities would be denied the services of another "good clerk."

I have some sympathy with the demand for pharmacists in our growing communities, but I believe that the qualities of mind and industry which will enable the student to do creditable work in college courses, not de-emphasized so that they could not be accepted for transfer to another curriculum, are the qualities which make for successful pharmacists in all phases of pharmacy.

Business courses, when offered, were limited in number and in scope and were sometimes of a superficial character.

Courses in the humanities and social sciences, except in the church-related colleges, were usually limited to freshmen rhetoric and composition and introductory or survey courses in social science.

The Pharmaceutical Survey had a galvanizing effect upon pharmaceutical education. This was initially due to the facts and judgments published by the Committee in its *Findings and Recommendations of the Pharmaceutical Survey*. The more important effects were due to the papers and discussions presented at the twelve previous Teachers' Seminars. It has been in these sessions that the inventory of assets and liabilities of the existing curriculums has been analyzed and new goals set for the future.

As a result of these discussions the first of the two major curricular recommendations of the Pharmaceutical Survey has been generally achieved. This called for the immediate improvement of the existing four year curriculum. It would be a most determined pessimist indeed who would maintain that no improvements had been made. On my part, I am convinced that there has been much improvement in quality as well as variety in the pharmacy curriculums.

The more obvious changes have been in the increased offerings in pharmacology as distinguished from the older courses called materia medica or other names. Quite usual were the inclusions of new courses in introductory zoology, vertebrate anatomy (or comparative anatomy), and human physiology as prerequisites for pharmacology.

The rise in the number of hours devoted to business subjects was a second obvious change. The advocates of these subjects had been skirmishing with the traditionalists of pharmacy and pharmaceutical chemistry for a number of years but making only small gains. It is possible (but it probably will be disputed) that this comparative fruitlessness in their efforts stemmed from a lack of agreement among the advocates of business principles as to the choices which should be made from the large area of business administration. If this be a true hazard, then it can be said that the conference called by the Pharmaceutical Survey to discuss this aspect of the curriculum was the first effort to bring order to the requests of business oriented teachers. From this report came an acceptance of the title "pharmacy administration" by substantially all of those interested and a delineation of the basic courses which were suggested

for all well-balanced curriculums. While there was agreement that all of pharmacy administration had these fundamental bases, there has been much argument as to whether the courses listed in this category were sufficient to provide an adequate business base. It is the old disagreement but with new and polysyllabic words between those who view the practice of pharmacy as wholly a distributive function, providing outlets for drugs as merchandise and others who view it primarily as a consultative and advisory profession with special knowledge and skills but who must, of necessity, understand how to survive as business men. The former hold the opinion that business success can be insured by completing more than fundamental courses in economics, marketing, management and accounting, while the latter are of the opinion that the fundamentals are all that are necessary.

Pharmacognosy and botany have also undergone substantial changes in the curriculum. Traditionally and historically they were distinctive, descriptive sciences in pharmacy. The age of synthetic chemical drugs created, in the minds of some, a doubt as to their places in pharmaceutical education. Happily, a review of the purposes and usefulness of these sciences has reassured them of a place in the pharmaceutical curriculum. Vital and inquiring young scientists have made and will continue to make valuable contributions to pharmacy. It is well for those of us who may be tempted to give all credit to the inventiveness of the pharmaceutical chemist to remember that initial clues to most of the fore-runners of modern synthetic drugs came from substances isolated from natural products. The continued investigation of natural products must not be discontinued and pharmacognosy must not be allowed to vanish from the essentials of pharmacy.

I need not remind this audience of the changes which have taken place in chemistry as it is taught in the pharmacy curriculums. For the most part the changes in these courses have been dictated by the changes in the thinking of chemists in the colleges of liberal arts and sciences. Since a large proportion of the hours devoted to instruction in chemistry is concerned with chemistry as a basic science and is most frequently taught outside of the colleges of pharmacy, pharmacy faculties have had little to say about the direction which instruction has taken. This, in my opinion, is a fortunate thing because it has kept instruction in chemistry out of the area in which pharmacists of an older generation have had such a retarding influence.

If I were to pick a development in the teaching of chemistry in colleges of pharmacy which was worthy of special mention, it would be physical chemistry. More new curriculums have included this than any other title in chemistry. This has been dictated by the demands of present day pharmaceutical technology. The race to produce new and more effective and more stable dosage forms has called for the use of physical chemical principles in every successful case. Those faculties who made the additions early have led in the production of trained staff for the industry.

Pharmacy, the discipline which takes its name from the profession, historically had under its purview all of the sciences and their applications to the production and distribution of drugs. It was the mother of chemistry, of pharmacognosy, of *materia medica* and its masters taught their apprentices how to make a living. This tradition of comprehensiveness has endured in some places to modern times. Some of our text books on pharmacy have carried

the encyclopedic approach to an extreme which threatens to immobilize them from sheer weight.

The more recent attitudes toward the scope of courses in pharmacy have been not only soundly based on the informational side but also have stimulated the student to a creative use of the basic sciences. It has not seemed sufficient that the graduated pharmacists know the vocabulary, the tools, and the fundamental preparations of the USP and NF. He is expected to be able to understand the principles underlying the latest dosage form of an old drug or why one dosage form may be expected to be more effective or less irritating than another. Advertising claims are usually put forth with the enthusiasm that should be reserved for new discoveries. The informed pharmacist is frequently aware that the information on which the claim is based is new only to the copy writer.

It was suggested by some creative thinkers in pharmaceutical education that the principles of physical chemistry could assist in solving many of the perplexing problems of stability and shelf life, as well as efficacy in therapeutics. It was proposed that the pharmacy curriculum should make an attempt to teach the undergraduates some of these principles as a basis for what was hoped would be future creative activity in this area.

At the Teachers' Seminar in 1949 the term "physical pharmacy" was used as a title for such a course. The idea was so sound that it met with immediate and general acceptance. It became the approved thing to have a course in physical pharmacy in the catalog.

The general acceptance of the title is not matched by a correspondingly general concept of what instruction should be included. This varies from some elementary physical measurements which should have been made in beginning courses in chemistry and physics, through some fundamental concepts of physical chemistry, to courses which concern themselves with the study of problems of pharmaceutical significance.

The teachings of the subjects called pharmacy have been and are the most difficult to change. The production of an "elegant preparation" by the exercise of an art has an attraction to both teacher and pupil. To forego this pleasant exercise even though the elegant preparation is so seldom used as to be almost useless requires a great deal of discipline. To give it up for a series of studies on surface tension or particle size on a manufacturer's specialty seems almost a denial of the art. I am reminded here of a paper presented to the Section of Teachers of Pharmacy about 1948 or 1949 with the plaintive title "Is Pharmacy No Longer a Major Course in the Pharmaceutical Curriculum?" I hope the author has found the answer to that question in the resurgence of pharmacy to its rightful place as the capstone of pharmaceutical education.

Graduate studies in the pharmaceutical sciences have had an amazing growth in the past three decades. This growth was initially encouraged with the potent aid of funds from the American Foundation for Pharmaceutical Education which also sponsors these seminars. Too much cannot be said in appreciation of the foresight of the founders of this Foundation and of the continuing efforts of the present members of the Board of Directors and the Executive Secretary in securing funds and supporting graduate education. Presently their

substantial aid is being augmented by grants from agencies of the federal government.

Without the young teachers and investigators trained with the help of these funds, pharmaceutical education would have either been overcome by mediocrity or have become a minor appendage to medical education. All of its creative potentialities would have been claimed by other disciplines. But the Foundation was created, it is currently functioning, and pharmaceutical education is supplied with a nucleus of well-trained teachers who will train their successors. There is not an adequate supply of these to satisfy the needs of both education and industry, but there is hope for the future.

What, then, is the outlook?

I see on the horizon a system of pharmaceutical education which has come to grips with the problems which professional neglect and educational indifference created and has mapped out its course of action to overcome its shortcomings and insure its future growth. I see a substantial beginning toward a dynamic and creative professional education.

I see the image of the professional pharmacist as a person fitted by education to look upon himself as a co-worker, not a handmaiden, in the field of the health sciences. I see him prepared by education to take his place naturally as a community leader. I see him conditioned by his education to make hard decisions between expediency and public good in favor of public good. I trust that you and I may share in the reward that comes to all teachers who have done their best.

The control of the learning environment is the only control rightfully exercised by the teacher.

M. O. Pella, *Am. J. Pharm. Ed.*, 14, 423 (1950)

GENERAL EDUCATION

THE MAKING OF A PROFESSIONAL

LOUIS T. BENEZET

The presence of a liberal arts administrator in the midst of a conference on professional education may bear resemblance to the proverbial skeleton at the feast. Perhaps it would be closer to say I might remind myself of a cruise passenger who opens the wrong door and stumbles into the midst of the engine room. Your conference planners were kind enough to invite me here. I understand my assignment to be a discussion of the merits of liberal or, as you may prefer, general education in the professional curriculum. To some that might bring to mind even a third image, namely, the missionary among the cannibals.

If I do nothing else today I should like to get rid of such figures. It is time we looked together past the apparent cold war between liberal and professional education. What we shall find I think is that we are bandying loose terms around our campuses, many of which have no clear referent; that we are taking brave stands like Horatius at the Bridge, when actually no enemy approaches; and that we are missing what is a much-needed agreement about the job all of us as educators ought to be doing. If we could forget for one hour such curriculum labels as "general" and "professional" and talk instead about the kind of human beings education must produce who will wear the label "American professional man," we would find little to argue about.

My thesis is that the American professional man in his full dimensions is the most important need of society today; that the American professional man at his worst is our greatest liability; and that it is up to the professional schools, with the universities which support them, to supply the right answer. Largely depending upon his preparation for and orientation to modern life, the professional man may help us, in the words of Lincoln, either "nobly win or meanly lose the last best hope of earth."

One of the first things we could agree about professional people is that they all are in short supply. When I read bulletins of medical schools, business colleges, departments of teacher education or colleges of pharmacy, I see everywhere the phrase, "The extreme shortages of the profession." In terms of numbers, the major professions such as teaching and business each can show figures to the effect that they would need to absorb nearly half the graduates of American colleges in order properly to reseed their profession. Engineering has the same story to tell. From your publications I gather pharmacy has a similar complaint.

The shortage among professionals is a product of the technological revolution, whose full implications are not yet grasped by the citizen or by Congress. To hold back money for higher education expansion because it is "too costly" is like refusing to invest money because you don't have as much as you want. Fortunately our young people are smarter than their elders in government about the soundness of borrowing money to finance a college education. I have just returned from three days with the National Student Loan Consultant Board in Washington, and I can report

that the only limitation in money students will borrow for their education is the hesitancy of Congress to live up to its original authorization of funds. Those authorizations call for \$61,000,000 in loan money in 1960-61; student requests would consume this easily; but Congress so far has refused to appropriate more than \$44,000,000. In almost the same day that Congress refused to loan \$17,000,000 additional to students, it increased our national defense budget five hundred million dollars over the administration's own request, and plumped up the payroll of federal workers by another 740 million. So much for the mathematics of national investment.

Only partly from lack of funds, and partly also from unwillingness among contemporary students to postpone personal pleasures like marriage and home laundries, we are not getting enough college people into the graduate professions. It won't help to scold or wring hands; the answer lies in making professional careers more attractive in terms of what it is that men live by. Without a long philosophical argument, I submit that what men live by is recognition from their fellowmen, thus convincing themselves that they are desirable and important in what they do on earth. The most desirable and important people are those to whom others turn for advice and inspiration. To me the latter term is crucial. The fact, for instance, that physicians since World War II, deservedly or not, have gained a reputation for high fees, prosperous living, and less service to patients, may have a part to play in the decrease of applications for medical school. It also seems true that fewer of our young people wish to postpone living comforts long enough to go through ten or twelve years of medical training. Yet if the image shone brighter to them there might be more appeal in it. The same I believe applies to many professions in this era when the amount of income tax paid—or should we say skillfully reduced—is more a hallmark of success than the quality of service performed.

What I know of pharmacy and pharmaceutical education is so slight that it should confirm any doubts you have about my being here with you. I will talk rather about the pharmacist and his fellow-professionals. Here I submit again that your work takes on meaning in the degree to which you can turn out pharmacists who are competent individuals in the broadest sense. By competent pharmacists I think first, with you, of a man who knows his business. That is the job of the professional curriculum and you have this well developed. But the business of the pharmacist, like that of the doctor, the engineer, or the professional of any kind does not end in his back room with his retorts, his undecipherable labels, and the time-honored mortar and pestle. His business merely begins there. It is hardly enough any more to consider the pharmacist successful if he manages to avoid poisoning his clients. The pharmacist will be successful first, to the extent that he knows his business in the broadest terms, including human communication and ethics; second, to the extent that he is an interesting human being, able to live with himself, and is a successful family man and neighbor; and third, to the extent that he is a citizen capable of contributing to solutions rather than problems in the vast muddle of world citizenship ahead. None of this will proceed direct from reading one's pharmacopeia.

Concerning the active citizenship of the American professional man I have a special worry. One of the traits of modern professional men is

that they spend more and more time at their work, not just to make money, but to keep up with the swift onrush of new knowledge. Thus they spend less and less time on the activities of the citizen, which in turn are being more and more taken over by other professionals, in this case professional politicians. Now while I agree with the philosopher T. V. Smith that politics is an honorable profession, the American democracy was designed to operate by the active engagement of all its enlightened people. Towards this end the keystone of Jeffersonian democracy has been the broad education of its leading citizens. Professor Kenneth Underwood of Wesleyan University was speaking for colleges of pharmacy as well as for the colleges of liberal arts when he wrote recently:

What responsibility does the college and university have in the development of public leaders? The question is important both for men who direct public affairs outside the university and for scholars and teachers to face in a democratic society. For democracy is the self government of a people who by virtue of disseminated wisdom, quite as much as by natural right or inalienable powers, have a right to rule. And if the college or university is not one of the prime agencies for the spreading of wisdom and knowledge, it is nothing at all.

My discussion so far has avoided the focus of what to teach in the professional curriculum and there must come a reckoning with it. Yet it seems important first to describe the dimensions of this professional man we are producing. You may reject the whole idea of attempting more than the technical elements. "Education for responsible citizenship" is, after all, educator's rhetoric, a hold-over from the commencement oratory season. Furthermore, there is no time. As to this, two comments:

If the American university rejects the assignment of citizenship education in its professional curriculums, it not only leaves the nation's political destiny to professional politicians; it also leaves the political destiny of the world to those nations which do believe in the political commitment of all their citizens. Their strength is fanatical. The devotion of university students among the uprising younger countries to political causes is genuine and cannot be explained away as the work of Communist agitators. By contrast, witness the apathy on most American campuses to current world issues of the gravest kind. If it is the university's answer that these matters should be referred to the graduate school of political science, then we have come to a specialism that can destroy the American democracy in a generation, as it destroyed Rome fifteen hundred years ago. All that waits is a foreign political alliance of really major proportions. Meanwhile, the confidence abroad in American political idealism declines.

Second, to speak of citizenship education as a job of all branches of the university, professional schools included, need not mean exclusion from topics of their own interest. As all of you are aware, there is going on in Washington a critical inquiry into the relationships between the United States Food and Drug Administration and the major drug corporations. In the course of it, one top USF & DA official, now resigned from office, was found to have made over a quarter of a million dollars from professional activities connected with some of the very companies whose products he was appointed to review. Advertising based on endorsements by non-existent physicians has been introduced into the record. Pricing policies involving fantastic markups have been debated. The ethics of a major industry and the safety and economy of the public have been involved. The issues are

complicated; right and wrong are yet far from clear. Is there not material here for citizenship education *par excellence* in the classrooms of a college of pharmacy?

The kindly corner druggist is an American prototype; he has been memorialized on countless magazine covers and in a scene of Thornton Wilder's classic, *Our Town*. As a citizen he has come a long way from the eighteenth century apothecary and further yet from the Merlin-like alchemist of the Middle Ages. In 1960, however, his responsibilities have traveled just as far from days of 1900 and its comfortable reliance upon ipecac, Father John's Remedy, and the redoubtable Lydia Pinkham with her love for the human race. He must now not only be a passable organic and biochemist; he must be able to interpret government regulations both for drugs and for business practice. He must be a student of public health as well as a keen observer of medical progress. Responding to the groundswell of public concern over disease and its treatment, he needs an ability to communicate his profession both formally and informally; and this involves the wisdom of ignorance and caution as well as of knowledge, in the face of the credulous customer. He can never escape the responsibility typified by the late drop-in rasping out his eternal plea, "What can you gimme for a pain?" Once more, in all these roles, a good deal more than textbook pharmacology is involved.

What then, at last, is a suitable educational program for the professional man, in this case the pharmacist? To make the comments reasonably pertinent I shall refer to the five year curriculum of the University of Colorado's School of Pharmacy.

First in any modern career preparation is the problem of the explosion of knowledge. This threatens to confound medical education entirely, and no doubt it affects you. The five year program for the bachelor's degree in pharmacy follows a trend taken in recent years by almost all graduate professions except engineering; and in that field it seems to be more a matter of competition for students than college preference which holds on to the four year course. The 100 or so semester credit hours devoted at the University of Colorado to chemistry, pharmacy, and closely related subjects will no doubt be called minimal by experts in the field; indeed, without being told I would guess that the ten to fourteen hours listed as "nonprofessional *and* professional electives" in the fourth and fifth years end up as professional for most students.

The outsider might raise the question as to just how many courses in what might be called applied pharmacy are needed: for example, accounting for the pharmacy, manufacturing, pharmacy practice and management, etc. This is part of a general question asked of all professional education: how much practical work should be attempted in the classroom, in view of wide variances in the field and the obvious need to learn applications on the site of one's particular job? If the answer should involve the question of what might be taught in its place, I would argue for some courses I find missing; though doubtless they are available within the university as electives: e.g., human physiology, psychology, general and abnormal; urban sociology; local and state government; and business law. In this day and age I would also argue for a two-year sequence in modern foreign language, taught for direct communication.

Now that the background and biases of the speaker are showing, we might as well face directly the subject of liberal arts content in the professional curriculum; and I can only hope that the agreement we may have reached on the kind of human product we want, will make the going easier than it might otherwise be.

The University of Colorado Pharmacy curriculum gives a minimum of twenty-eight and a maximum of thirty-eight semester credit-hours over to "general electives" and required general courses, such as freshman English, economics, and speech. Biology and elementary math might likewise be so listed, which gives us fourteen more general-course hours.

I would raise a point here concerning the common confusion in professional schools between courses for general education and courses which are merely tool preparation for the speciality and which are usually taught from that standpoint. Elementary subjects such as math, English, and biology should be classed in the latter category. This allotment of general courses is more generous than many professional programs I have seen. The question must always be whether they really have a chance to do the liberalizing job they are presumably put there to do. One notes the customary fade-out of general courses by the end of the third year. Actually the student in those later years is better able to appreciate some of the side-roads of his education; but it is a rare program for any profession which leaves room for side-road learning in the final semesters. Thus the specialist reproduces his own kind.

The fact remains that in most professional education, liberal and general courses are treated by the student as apprentice chores to be worked off, more or less like Army K.P. This reflects too often the attitude of his instructors on the professional side, and too often also the uninspired teaching of liberal arts professors who have been shanghaied into service in the professional school program.

A college curriculum of whatever kind must express a continuity and harmony of spirit if it is to mean anything. Isolated courses of odd sorts cannot be thrust into juxtaposition like bricks in a wall. There is no way of guaranteeing a broadening effect from a single course that meets Mondays, Wednesdays, and Fridays from 8 to 8:50 a.m., regardless of who teaches it, in what manner, or of what follows it next hour, or of what course may carry on its contributions next semester. Freshman English, for instance, is a tool subject, and is as impotent to teach mature enjoyment of literature without a second-year course as foreign language is incapable of teaching competence in one year.

I shall perhaps be reminded at this point that there simply isn't room for a second year of English or such-like in the crowded professional curriculum. In that case I should hope that some of the pharmacy professors may have discovered the possibilities of using literature to help teach their professional subjects. The career of Hadacol, for instance, is accurately foretold in H. G. Wells' *Tono Bungay*. Man's fight for public health in the community is better understood after reading Ibsen's tragedy of Dr. Stockman, the well-meaning physician, in the play *The Enemy of the People*. The professor who uses literature to enrich his professional subject not only enlivens his class; he continues that spirit of broad education

which should underscore every profession, and characterize the university in all its branches.

For in the final analysis, professional education will prosper or not according to the extent to which it uses the full resources of the university setting. This is less a matter of courses than of breadth of participating interest. There is no golden label called "culture" on a subject merely because it happens to be taught in the college of liberal arts. It is quite capable of being taught as technically as any, and often is. In the same way professional courses can start up the student's imagination and take him anywhere, if the teacher himself is a man of imagination: if he is a teacher who seeks to turn out more than a dutiful class of mechanics.

In all education there must be training; that is, disciplined control of certain learned operations, achieved through drill and repetition. But the nature of a graduate profession requires that in training there also be *education*, meaning the stimulation of the student to think and act for himself. Education impells him beyond the training he has received. Training produces identical behavior; education produces new developments.

The best way I know of assuring that there will be education as well as training in a professional school would be to see to it that the school functions as a full member of the university, which once again is defined as a community of scholars. If the school's students and faculty isolate themselves and talk only with their own kind this will not happen. But if the professional school students as well as their faculty make full use of the university library, its galleries, its lecture halls, concerts, forums, and discussion clubs, a lot of education can go on. This betrays my conviction that college education after all is less a matter of courses, exams, and papers than it is *an attitude of mind*, acquired through contact with other able minds, under the most favorable conditions. As an administrator I see it my duty insofar as possible to maintain the conditions fostering this continual mutual abrasion of minds. If that happens, I don't much care what goes on in the classroom. Enough will then happen there as well.

And if the professional schools, pharmacy included, can set themselves to their tasks in the same spirit, we shall see coming out of the universities a keener product, better able to take on the gigantic responsibilities that lie both inside and outside the careers on which we are engaged.

The distinguished psychologist Hadley Cantril recently remarked that the chief difference he has found between man and the other animals is man's perception of value quality. If it were not for this gift of value, you and I who work in the colleges might as well be animal trainers. Because value does exist in man, his education remains an absorbing challenge. And because man can increase in this perception of value there is always hope for the future.

GENERAL EDUCATION VALUES IN THE PHARMACY CURRICULUM

LOUIS W. BUSSE

It is appropriate at this time that we once again examine our pharmacy curriculums to search out their educational values, because this fall we inaugurate on a mass basis our long-awaited experiment with five years of education as a requirement for licensure. I am quite sure that in spite of the many long hours of deliberation and study put in by the Survey Committee and the Curriculum Committees of the College Association, little attention has been paid to the recommendations of these committees. I am afraid each of us has pretty much designed his own pattern for a curriculum, and that there is no more uniformity in the five year program than in the four year. I suspect the same might be said for the organization of courses and course content, although *The Pharmaceutical Curriculum* by Blauch and Webster could have served as a guide to lead us all to a more standardized pharmaceutical educational program than ever before. One of the areas of the curriculum in which we probably vary the greatest is in the area of general education. For these reasons I think it particularly fortunate that we have the opportunity to re-examine the results of our labors over the past years, and, in my particular case, to examine it specifically for its values in general education.

I know the position I feel I have to take today in the presentation of this paper is somewhat unpopular; nevertheless, in order to derive any benefit from the program I feel I must play the part of the "devil's advocate" and call attention to general education values in the pharmacy curriculum. I would first ask the question, "How much, in the way of what is commonly referred to as 'general education,' can we afford to have in our professional curriculum?" I put this question to you in such a way as to ask, "What is our first responsibility to our students?" Is it not to give them the finest professional training we are capable of giving in the time allotted to us? Now, if we do not have enough general education courses in our curriculums, or the opportunities to elect a sufficient number of such courses, it must indicate that our people designing our curriculums feel that these professional courses are essential to the proper professional training and cannot be sacrificed. The fact that most of the schools of pharmacy found it necessary to utilize such a large number of the credits available for professional courses must lend some assurance as to the necessity for these courses in the training of a pharmacist. I would add this last remark to this line of thought, "our schools of pharmacy are in existence today primarily because state laws require students to attend them for the purpose of assuring professional competence." Pharmacy schools have this obligation and this must receive *preference* over any other consideration. We have the responsibility to society of developing an educational program that will produce a pharmacist who is professionally competent and one who will not endanger the citizens in any way because of lack of proper training. This training must be such as to permit the practitioner to adjust to changes and advances in the profession over the years of his practice. I feel it necessary to establish this point, and this has to be kept in mind as we consider this subject today.

Now, I am sure no one is against "general education" or what it stands for—least of all the leaders in pharmaceutical education. I think the staffs

of all of our professional schools are aware of the need for our curriculums to provide a broad education as well as technical training. This is a part of the heritage of being members of a university community. If not, we should be associated with a trade school. I am not sure, however, that we are all in agreement as to how we can achieve a "broad education" in a technical curriculum. I fear many feel that all there is to it is to include in the curriculum some doses of so-called "general education subjects." In this regard let me quote from the report *The Liberal Aspects of Technical Education* by Sir Richard Livingstone published in 1956 by the Yorkshire Council for Further Education: "If you are going to study a subject you must know the general principles behind it" and then he goes on to dispose of the erroneous notion that the way to "liberalize" a scientific or technological curriculum is to inject into it some doses of literature, history or other "cultural" subjects. Professor M. V. C. Jeffreys, Professor of Education at the University of Birmingham goes on to state that "The introduction of 'Arts' subjects in curriculums of science and technology is not fundamental to a liberal education. What is required is a broadening of the treatment and presentation. The approach may be through a history of the craft (profession), a study of the structure of the industry, the philosophy of the subject, the human relations in its industry."

Now, if we analyze the pharmacy curriculum we find that the curriculum is not a narrow, technological or scientific training. It is extremely broad in its treatment of sciences. It is not narrowly chemistry, narrowly physics, narrowly biology, nor narrowly mathematics. It treats each field of science relatively completely, e. g., chemistry is treated in all its phases from fundamentals to its logical application to the chemistry of drugs and the body. In this way pharmacy students can appreciate and realize the significance of the many wonderful discoveries in the field of public health and actually feel a part of them. The same philosophy may be applied to his training in the physical sciences such as mathematics, physics, and physical chemistry. All of these help him to understand the world around him and give him an appreciation of its orderliness and preciseness and prepare him to understand and appreciate the whole new world we will be living in in the future—the world of atomic energy. Many adjustments will have to be made and these will be made easier by people who understand.

In biological sciences, the pharmacy student is taken through a sequence of courses which cover the beginning of life, as we understand it, from the metabolism of minute forms of life in botany, zoology, and bacteriology to the manner in which life exists in man. This gives the pharmacy student a wonderful background for understanding himself and others and helps him to live with and appreciate others. In addition, through applied courses in pharmacognosy and plant chemistry, it helps him to learn of the progress man has made in understanding plants and animals and how man has learned to use the products of the metabolism of these forms of life for his own use. The stories of the discovery of digitalis by Withering, morphine by Sertürner, quinine and cinchona by Pelletier and Caventou, and the work of Ehrlich in establishing chemotherapy, the wonderful stories behind the discovery of vitamins and the antibiotics and the men who made these possible, are all a part of the pharmacy student's education and serve to stimulate him and to direct his thoughts in the service of mankind.

What is needed in pharmaceutical education is not just to introduce some "arts" or "humanities" courses into the pharmaceutical curriculum, but is broadening of the treatment and presentation of the subject material at hand in order to have our students realize the full significance of their education and their calling.

Through the professional courses of the pharmacy curriculum the student is imbued with a sense of service to the public and to the allied professions, along with a deep sense of responsibility to one's fellowman. Through a rigorous course in law and ethics a code of behavior for the practice of the profession is generated, which will also give him a background for the understanding of most human relationships.

Through our courses in the area of business relationships and economics our students acquire not only the knowledge for the routine operation of a pharmacy but, in addition, an appreciation of the business and industrial world one lives in and how they can adjust easily and readily to the revolutionary changes taking place in this phase of our lives. All of this serves to make the pharmacy graduate of today a broadly trained young man capable of taking his part in the affairs of society, and one who realizes his responsibility as a professional citizen of our society.

Now, last and even more important to the general education values of our curriculum is the history of our profession. It is really through a basic and thorough understanding of the development of our profession and its relationships to society through the civilizations of history that one is introduced to the cultural values in our profession. Here, the pharmacy student has a wonderful opportunity to learn of the impact of pharmaceutical developments and discoveries by pharmacists upon the development of civilization in general and, specifically, the contributions of pharmacists' discoveries to the industrial revolution. In so learning he is imbued with the fact that pharmacy has been a part of society from the beginning of history and that the profession can influence sociological developments as well as sociological developments can influence the profession. A healthy profession is one whose members are filled with a full quota of pride. Here I would like to take a paragraph from the address of the President of the AIHP, Dr. Hugo Schaefer, which was delivered at the A.Ph.A. meeting in Cincinnati last year: He states, "Dr. Edward C. Elliott in his monumental study in connection with the Pharmaceutical Survey devoted considerable space and time to a discussion of a trend in pharmacy toward commercialism, with emphasis on monetary advantages, rather than on professionalism and its higher cultural values. He stated that what the average pharmacist needs most is more pride in what he is doing. Certainly, a knowledge of the great contributions made to world progress in the past by our profession and an appreciation of present opportunities to make further contributions can do much to overcome these faults found by Dr. Elliott." He goes on to state, "Pharmacy has a proud tradition of contributions and accomplishments, and of unselfish service to humanity, and a review of the record can do much in stimulating our young people to become imbued with a spirit of imagination and purpose sufficiently strong to make them better and more dedicated pharmacists in the years ahead."

In summarizing this area, I believe one could say that—the understanding of trends; a pride in the heritage and dignity of pharmacy; a key to service and satisfaction in life; an understanding of the origins, development and in-

fluences concerning the issues and achievements of pharmacy alike—all may be quite as important to the ultimate welfare of a buffeted profession and to the individual pharmacist as is scientific knowledge alone.

I would say that as we assess the general education values of the pharmacy curriculum, this is the one area where we have fallen short of reaching our potential. Pharmacy schools in general have not added courses in the history of pharmacy, nor have they given this area the attention it needs so far as staff requirements are concerned. Throughout the years of pharmaceutical education in this country, Wisconsin has a long tradition in this field. From Dr. Kremers to Dean Uhl and Dr. Urdang, and to the present Dr. Sonnedecker and Dr. Stieb, we have tried to make pharmacy faculties aware of the necessity of this area of pharmaceutical education. History of Pharmacy was recommended as a required course in the early curriculum developed by the Survey Committee, but somehow it got lost and we do not see it in the curriculums going into effect in the colleges in 1960. This is a serious shortcoming and I urge all of you to assume your responsibilities as pharmaceutical educators and see to it that this subject not be treated as a stepchild in the pharmacy curriculums much longer.

Now, lest I be completely misunderstood, I don't want to leave the impression that professional education can or should completely replace courses in general education. I have been trying to make the point that the broad scientific, professional, and business training which makes up the pharmacy curriculum has general education values to a much greater extent than do most other scientific and technical curriculums. Therefore our need specifically in terms of numbers of credits devoted to general education could be much less than the requirements of other professional curriculums.

In analyzing general education in relation to science education I would make this criticism of general education faculties and courses as this area of education might apply to professional curriculums. Up to the present time I know of no general education program designed specifically for students in professional curriculums which has as its specific purpose or aim that of accomplishing the objectives general education is purported to accomplish in the education of a student. I do not believe that the helter-skelter selection of courses among subject areas accomplishes the objectives general education is supposed to accomplish. It is my conviction that if general education is necessary we should have general education with a purpose and, that while the student may have free choice of area, he should have much firmer guidance in *patterning* his general education electives than is the case at present. Just as science courses must be taught in depth to understand the significance of science, so I would think that a subject area in general education must be taught in depth if it is to contribute any significant knowledge to the extent that it can make a difference in a person's life. General education ought to do this for a student and so perform a useful function.

In an article by M. V. C. Jeffreys, Professor of Education at the University of Birmingham, Birmingham, England, which appeared in the *London Sunday Times*, March 1, 1959, he has this to say about the "arts" function:

The faculties of arts have not expanded to the same extent as the science faculties and are therefore losing relative importance and influence. It is expected that, by the mid-1960's, two-thirds of the total increase in the number of university students will be in science and technology. There is also the awkward question which, in the interests of self preservation, arts faculties

must try to answer; namely, what is to be their real function in the world of tomorrow, apart from producing teachers to produce more arts students. (It is true that a good many arts graduates go into business or other occupations, but their place will increasingly be taken by people trained in science and technology.) To be healthy a faculty of arts ought to be in living relation with the world outside as is the case with science. It is a weakness of arts faculties that they do little or nothing to 'sell themselves' to the outside world and expect to go on living on the dubious prestige of intellectual pursuits which may be ornamental but have no obvious use. C. S. Lewis has said, 'The intelligentsia (scientists apart) are losing all touch with and all influence over nearly the whole human race.'

To be in a really healthy state, academic faculties ought to fit people for jobs as well as giving them a general education. The strength of the centuries-old university studies, theology, law and medicine, is that they have done precisely that. This principle is surely capable of extension in ways that would induce the outside world to turn to the arts faculties as it does to the departments of pure and applied science.

In conclusion I would like to leave this idea with you as it might pertain to general education and the professions; namely, should not universities encourage the growth of the idea that one's education is not complete with the university degree but that we consider this rather as an introduction to further study? In this regard we should provide for the gradual expansion of the opportunities for continuing one's education. Applying this idea to professional education and general education, would it not serve a better purpose for the real general education courses to be acquired during this latter period when you would be dealing with a more mature mind and person—one that would be much more receptive to the objectives and purposes of general education than the younger, more immature mind would be—because the student with a career in mind seeks only to be involved with courses pertaining to his career? In this way, with a humanities background, I believe we could better balance the almost complete attention generally given by younger men to technical knowledge and competence.

Much has already been accomplished in this regard through grants and studies initiated through the Ford Foundation—funds for adult education. Much more needs to be done, of course. Nevertheless it should be considered along with all of our other ideas and studies apropos to our problem.

I feel confident that technological and professional training will be even more demanding in the future and that the battle for credits between technology and general education will be even more drawn than at present. We cannot lengthen the period of training indefinitely to assure a complete education, and, therefore, I wonder whether the solution to our problem may not be in creating the atmosphere and environment for more self-education and for a closer tie between extension and adult education and the faculties of our universities to provide for a more gradual expansion of these opportunities. We should all urge our universities to provide programs of adult education for our graduates which will keep them up to date in their changing fields, and to provide general education from which the adult college graduate can benefit much more in his maturity than as an undergraduate. If general education is (as so often is stated) a means by which democracy gains strength to deal with its problems in the modern age and serves as a mainstay in the lives of those who render professional service to society, then I wonder if the most successful way to accomplish this goal may not be through continuing adult education programs for the professions rather than through the dilution of the undergraduate professional program.

EDUCATION FOR DEPTH

THE DELINEATION OF THE PROFESSIONAL DISCIPLINES

LOUIS C. ZOPF

We in the United States are fortunate in that we are conditioned to expect change, to accept challenges, and to be amenable to the critique of colleagues and strangers alike. We are products of an educational system which reflects progressive thinking, and although we sometimes resist the implementation of new concepts, we soon recognize them to be integral parts of the modern educational matrix. The quality and abundance of knowledge which has become available in every avenue of intellectual pursuit affects each discipline whether it be of scientific, professional or general educational design. The title of a paper carries with it considerable latitude on the part of the author, and perhaps what we are about to discuss is in reality a reflection of an over-all educational trend. Although the items of consideration differ, the principles are coexistent.

For example, chemistry—a basic science—has so many diversified specializations that it is difficult to believe that any one branch stands alone. In a recent discussion I asked a colleague in pharmacology to define pharmacology, biochemistry, and physiology. The challenge was readily accepted (perhaps enthusiastically in the urge to display acumen), but as the questions became more exacting my associate responded more generally, less vigorously, and definitely “hedged” in defining the boundaries between these disciplines. A similar situation frequently arises in the delineation of physical pharmacy versus physical chemistry. Certain of our chemistry colleagues have been bold enough to suggest that neither of these subjects deserves an identity of its own. These are the individuals who claim that physical pharmacy leeches the fundamentals from physics and chemistry to formulate its entity when in reality, these critics claim, physical pharmacy exists as a discipline only because of its value in explaining pharmaceutical applications.

If our seminars had been designed solely as conclaves for the personal gain of teachers of the various disciplines, they would have terminated at the conclusion of the first complete circuit—not for want of financial support, but for lack of interest on the part of the faculty members. Present attendance contradicts any possibility of a dissolution of these conferences, and it must be recognized that there are multilateral values emanating from such meetings. The younger teachers in this audience have not had the opportunity to benefit from the formal presentations and the informal associations of our first general seminar. The majority, however, have shared in one or more of the special area seminars, and some of us have the advantage of many such conferences. The more we share ideas, the more we recognize the need for integration of the individual disciplines.

The disciplines of the pharmacy curriculum are not confined by rigid boundaries. Quite to the contrary, we find that the margins of definition

are most flexible, and we are pleased with the change in course content and quality in each of the special areas of pharmaceutical education. Our seminars have as their purpose the strengthening of teaching methods. As teachers of professional subjects, we are frequently criticized for our lack of formal preparation in teaching methods. This criticism may in some ways be justified, but let us remember that pharmacy has been a leader in the initiation of seminars which are devoted to the modernization of our teaching methods and the constructively critical analysis of course offerings. The Pharmaceutical Survey of 1946-49 recognized the need for strengthening pharmaceutical teaching. The recommendations of the Survey are a matter of record, and we owe a debt of gratitude to the late Dr. Edward C. Elliott for his encouragement and insistence that a means of implementation be found for the continuous improvement of teaching in our colleges of pharmacy.

Many of us remember the first seminar in 1949 where, in addition to a two-week formal program, we debated well into the evenings on such subjects as the definition, delineation, and sequential arrangement of the various disciplines in the pharmacy curriculum. At that time fear was expressed that one major area might be absorbed within the boundaries of another, or that a particular discipline might lack sufficient credentials of justification when weighed against another. Concern for the responsibility of defining the various subject areas and for marking their boundaries still prevails; and for completely objective evaluation, it is essential that we remember that we are not drawing lines or building inanimate dividers—we are merely defining areas of responsibility.

Before we discuss the delineation of the professional subjects, let us agree that although our obligation is to expand the general educational qualifications of the student, we are basically responsible for the preparation of a professionally competent person. We are styling an individual as a pharmaceutical expert, as one who will absorb his facet of obligation within the public health organization. The individual must have an understanding and regard for pharmacy's heritage; he must be motivated to a life of service. He must be stimulated to maintain intellectual and professional curiosity and to keep abreast of developments—not only in pharmacy, but in the other professions as well.

The Association's approval of the new five year pattern for pharmacists is based upon modern educational principles and is further justified through the findings of the Pharmaceutical Survey. Basically, as pharmaceutical educators, we have accepted a foundational core of information which we believe must be represented by the individual known as a pharmacist. We realize the need for broadening the student's general education and the desirability of a more flexible professional curriculum. We recognize our professional product to be an integral part of society where he will be subjected to volumes of new facts, responsibilities, and decisions based upon change—some of which will affect his professional expansion, others his position within the community. We deplored the paucity of general education and the lack of opportunity for electives in our four year curriculum. At the same time, however, there has been revealed through our teachers seminars the fact that our professional courses should be modified and built upon more contemporary scientific and biological foundations.

Definition of professional courses has been a topic of general discussion formally and informally for the past several years. To believe that we could completely resolve differences of opinion now would be asking for a miracle. However, let us at the beginning recognize the necessity of compromise and the desirability of interdependence of all facets of the pharmaceutical curriculum toward the preparation of a competent pharmacist.

In 1958 the NABP, upon the recommendation of Dr. Robert L. Swain, adopted a resolution which was implemented through a joint committee of the AACP-NABP to redefine the "pharmacy" in a manner consistent with the present-day meaning, including in this definition its important distributive functions. Dr. Swain pointed out that practically every definition was quite obviously completely inconsistent with our modern concept of the profession, that they failed to recognize the changes which had taken place, and that perhaps in part young people considering pharmacy as a career get a very narrow and not altogether encouraging picture of the profession through such definitions. Perhaps it is appropriate at this time to read the definition recommended by the special committee.

Pharmacy is that profession which is concerned with the art and science of preparing from natural and synthetic sources suitable and convenient materials for distribution and use in the treatment and prevention of disease. It embraces a knowledge of the identification, selection, pharmacologic action, preservation, combination, analysis, and standardization of drugs and medicines. It also includes their proper and safe distribution and use whether dispensed on the prescription of a licensed physician, dentist, or veterinarian or, in those instances where it may legally be done, dispensed or sold directly to the consumer.

I will refrain from elaborating further regarding this definition and its modern reflections of the profession, except to agree that this definition presents a more realistic picture, a more accurate and contemporary statement. Before considering the margins of the professional subjects, let us also recall how pharmacy as a discipline is defined in *The Pharmaceutical Curriculum* by Blaugh and Webster.

Pharmacy, as a division of the pharmaceutical curriculum, deals with the principles, processes, and techniques which are ultimately involved in the fabrication of drugs and drug preparations and with the application of that knowledge and those techniques to the compounding and dispensing of prescriptions.

Pharmacy is further clarified in the following statements:

As an applied science, pharmacy is based upon physics, chemistry, and the biological sciences, from which fields of knowledge many of its principles are drawn. In the field of pharmacy the other subjects of the pharmaceutical curriculum come to a head; they make their contribution largely, but not entirely, through the subject of pharmacy. In other words, the study of the subject of pharmacy cements and crystallizes the knowledge obtained through other subjects; here the material previously learned is rounded out and takes on new meaning through application to health service.

This definition, drawn following very thorough reviews of the functions of a pharmacist as revealed by the Survey, is a comprehensive analogy of the professional courses in our curriculum.

In the professional subjects new pharmaceutical concepts are combined with basic science fundamentals. Here the emphasis is placed upon matters pertaining to drug standards, therapeutic efficiency, and aesthetics or acceptability of drug products. Dispensing, compounding, and services as distinct pharmaceutical entities become major considerations, but only fol-

lowing a complete understanding of the underlying principles. The metrology of pharmaceutical problems differs from the arithmetical consideration of chemical reactions primarily in the system of weights employed and because the problems generally deal with pharmaceutical formulary adjustments.

The evolution in pharmaceutical product manufacture has brought about a lessening of extemporaneous compounding, but in no sense has it eliminated the need for understanding of pharmaceutical techniques. A comparable situation exists wherein the medical student needs to understand the principles of surgery though he may defer all such operations to surgeons. Again, the need for differentiation of diagnosis and identification of very rare diseases, though seldom required of the physician, is still essential for his competent practice. These examples could be duplicated using other professional avenues, but if the point has been made that man needs to know more than he applies, we can proceed with our discussion of the professional disciplines.

The professional subjects of the curriculum normally embody orientation or introduction, pharmaceutical history, pharmaceutical techniques and dosage form evaluations, physical pharmacy or the application of chemical-physical principles to pharmaceutical processes, pharmaceutical technology, and pharmaceutical dispensing which certainly includes more than the term "dispensing" denotes. Assuming general agreement on the preceding points, let us remember that each of these courses has a responsibility autonomous in nature, yet interdependent with the other professional courses. Orientation and historical sequential arrangement are necessary to condition the student for his career as an integral part of a professional pattern.

Now for the first time the student encounters a professional course. Building the foundation for the understanding of pharmacy as a profession demands our best teacher from the standpoint of ability to motivate and stimulate students. Here must be weighed with extreme care the quantity of historical material introduced; here the heritage of the profession can be emphasized; here ethics can be discussed on an introductory philosophical basis, and codes of ethics and discoveries of great importance to pharmacy can form the securing hasp of a properly motivated student. As the orientation course expands and the student learns of the multiple opportunities offered by pharmacy, the teacher must bring into focus the desirability and value of each of the other disciplines, for only in this way will the student learn the positioning and importance of the total pharmaceutical curriculum.

Entering students will now have the benefit of basic chemistry, certain general education courses, and the possibility of some other introductory science foundations. But the courses in the pharmacy curriculum which truly separate the student from a basic science major are those in the professional disciplines, for it is here that he gains his insight into and concepts of the profession, its obligations, literature, and opportunities.

Pharmacy 1, or the introductory professional course, has made dramatic changes, moving from empirical consideration of pharmaceutical products to theoretical and scientific applications of the basic sciences. Here the

student is introduced to pharmaceutical processes and principles and is taught to recognize the application of chemistry and the biological sciences toward the development of dosage forms for human and animal consumption. This course, usually accompanied by laboratory, encompasses the introduction of pharmaceutical terminology and professional techniques and defines the application of basic science principles toward the development of aesthetic as well as therapeutically effective products. For the first time our student designs a pharmaceutical for therapeutic use. In this course he combines substances of a chemical nature in forms which will be tolerated by the biologic system. He becomes familiar with drug monographs and pharmaceutical nomenclature. He is introduced to the methods and importance of drug standardizations and toxicity ranges. He recognizes the need for exactness and becomes aware of the problems presented by odoriferous, unpalatable, or fugitive materials. He develops an understanding of pharmaceutical preparations which enable man to modify and control the release of therapeutic agents, but yet maintain acceptability from the standpoint of the patient. He establishes a regard for chemical materials as therapeutic pharmaceutical agents. In this beginning professional course the student combines traditional techniques with the new theories.

As professional pharmacy courses fortify his chemistry and biology backgrounds, we remove the student from the purely chemical and biologic arena into the realm of professional considerations. For example, it is assumed that in physical pharmacy our student learns the quantitative principles of science as they apply to pharmaceutical products. At this point he has advanced to a position where he understands the potential which exists in the interaction between certain molecules—some to the benefit of the product, others to the detriment of therapy. Even though complexing may take place, the student will be trained to predict the efficacy or desirability of the newly formed substance versus that of the original material. He will recognize, for example, that an altered biologic response may result through alteration of the ratio of drug to surfactant.

The comprehension required in the actual production of the emulsion, the aerosol, the suspension, and the chemical solution affords the student opportunity to apply his understanding of physical and chemical theories. By this time our student should be so professionally oriented that he cannot divorce therapy or toxicity when considering any chemical or combination of materials normally employed as health aids. He must understand how to equate materials from the standpoint of their therapeutic merit or their public health value. Through physiology, pharmacology, and his understanding of microbiology, he now has a broader and more comprehensive view of any product classified as a pharmaceutical. Earlier in our discussion we agreed that expansion of the basic science courses and progress in the professional areas demand that we have a constant and continuous re-evaluation of subject offerings. If our colleges of pharmacy fail to take advantage of increasing scientific and biologic information, then mankind and the profession will suffer as a result.

Lastly let us consider prescriptions, or pharmaceutical dispensing. Regardless of all scientific evaluations, we must recognize that there is still the factor of *secundum artum* as applied to the manipulative techniques of phar-

maceutical production. If this were the only criteria for the dispensing course, then we might recommend—due to the current reduction of extemporaneous compounding—that this course be reduced in length and importance. Fortunately, such is not the case. In this, the zenith course, is embodied a correlation of the total pharmaceutical curriculum plus the expanded understanding of professional and legal ethics of the profession. Here our knowledge of pharmacology weighs equally with our theoretical chemical information; here we stress the principles of good pharmaceutical dispensing. Here all courses consolidate and terminate in the quality which Dr. Swain described as a facet of the distributive phase of our professional responsibility. The student now learns the value of good interprofessional relations, as well as a respect for their co-existence in regard to public health.

In dispensing, the student moves from an inanimate contact to an understanding of his professional health function as it is practiced daily between pharmacist and patient. Recognizing the fact that contemporary mass pharmaceutical production affects the frequency of compounding there exists an ever-increasing need for understanding on the part of the pharmacist. He must be professionally competent to evaluate the newer potent therapeutic agents. In the prescriptions course we must develop and encourage professional poise and finesse. Here culminate all the theories of the curriculum and efforts of the faculty; here we encourage the student toward an understanding of therapeutic products from the standpoint of their chemistry as well as through their therapeutic activity. Here the student must recognize his responsibility as a pharmaceutical consultant to the health professions and as a guide to the public in the principles of good health.

The professional courses of the curriculum are as distinct and as necessary as the most basic of the sciences. I never have and do not now believe that the principles of pharmaceutical service, pharmaceutical products, or professional finesse can rightfully be expected to culminate through any other than the professional courses. However, I recognize, as I indicated at the beginning, that the professional courses require a sound scientific background. Teachers of chemistry, biological subjects, pharmacognosy, mathematics, pharmacology, and pharmaceutical administration all share in the development of the individual as a professional person. The lines of delineation must be imaginative. When we secure the boundaries and become so selfish in our attitudes that we cannot yield to the principles of academic freedom, then we have failed in two regards: we have not produced a qualified product, and we are not deserving of respect as academic individuals.

EDUCATION FOR DEPTH

L. D. COOLIDGE

This portion of your program has been entitled "Education for Depth." Your speaker feels especially privileged to be permitted to appear before you, particularly in view of his lack of any specific knowledge of pharmaceutical education. His only real excuse for being here is curiosity about the topic and a lively interest in education for the professions generally.

Your program committee no doubt had in mind the thought that comparisons among the several fields of professional education may lead to new insights into your particular problems. It may also have occurred to them that your morale might benefit from hearing from a representative of a field beset by problems perhaps even more numerous and troublesome than your own. Misery loves company, you know. What better company than that of a field of professional education which, during the past year, has been the subject of two major critiques. (R. A. Gordon and J. E. Howell, *Higher Education for Business* (1959), Columbia University Press, a study financed by the Ford Foundation; and Frank C. Pierson, *The Education of American Businessmen* (1959), McGraw-Hill, sponsored by the Carnegie Corporation of New York.)

Although my remarks derive largely from experiences in education for business administration, they will, I trust, prove applicable to your fields.

I hope that you will forgive me for speaking to you this morning largely in terms of personal beliefs. I do so partly because, for reasons entirely familiar to all of you, I am rarely able to proceed in this self-indulgent fashion before my own faculty in my own school. It, therefore, behooves me to take full advantage of this opportunity. Partly I do this in the belief that it is sometimes useful to have the speaker confess his faith openly, revealing perhaps a myopic vision or even total conceptual blindness, but at least taking a clearly identifiable position.

I will now try to do this. My remarks will be uninhibited by any specific knowledge of your field, by any concern for standards established by your accrediting groups, or by any thought of such practical matters as budget restrictions on what is possible. Also I will be assuming away—and I recognize that this may be somewhat irritating—the very problems which most of you are devoting your professional lives to, the problems of course content and instructional technique for pharmacy subject matter.

Time has been allocated for comments and questions at the close of these remarks. I shall look forward to hearing your reactions.

GENERAL STATEMENT OF THE THESIS TO BE DEVELOPED

May I summarize now the principal points which I would like to make with you.

1. That professional education is in fact guilty of many of the principal charges leveled against it, but that it shares this guilt with most other fields of higher education.
2. That we who are concerned with education for the professions have erroneously conceived of our field as being fundamentally

different from other areas of higher education, when in fact the similarities are far more significant than the differences.

3. That, in misconceiving professional education as being somehow unique, we have created a false dichotomy in which professional training is thought of as something different from liberal education. Our students' educational experience is thus conceived of as having two components: a liberalizing component and a professional training component. We have then largely disavowed any responsibility for the former—the liberal portion of the education—but have been highly vocal in expression of dissatisfaction with the results.
4. That this dichotomy has proved tragically undesirable and that we must now come to a more unified concept of professional education. Tentatively, I will suggest some of the content which perhaps might be appropriate for such a unified concept.

REVIEW OF THE COMPLAINTS AGAINST US

Let me remind you of some of the complaints most commonly filed against education for the professions. We are repeatedly accused of:

Excessive vocationalism at the expense of liberal education
Too much concern with subject matter and not enough with processes of thought
Narrow specialization and compartmentalization
Isolation from surrounding or underlying disciplines
Too much application, not enough principle
Superficiality in the interest of broad coverage rather than depth for real insight.

In my opinion we should concede the validity of most of this critique. The professional schools are in fact guilty of most of this indictment. And exactly the same charges can be leveled against nearly all other areas of higher education. They too must plead guilty.

Let's examine for a moment one of the most fundamental of the charges against the professional schools and colleges—that of excessive vocationalism. It is undeniably true that our programs are vocational. We are helping our students prepare for careers in the professions, and this by definition is vocational.

It is equally true, however, that most education from the very beginning has been vocationally oriented. This has been the case whether the education has been directed toward the pulpit, military leadership, practice of law, medicine, teaching, engineering, science, the performing arts, authorship, a career as a historian or social scientist, or for that matter pharmacy or even business administration. None of us is in any position to adopt a loftier than thou attitude in this regard.

In simple truth, few among us—notwithstanding the fine claims in the statements which preface most of our academic catalogs—have been or are really engaged in producing the well-educated man or woman, prepared for a rich and creative experience of full living and for exercise of responsible citizenship. These are high sounding phrases. They bespeak ideals shared

by nearly all. But their real significance is in revealing the guilt which we feel when confronted by our own curricula.

It is almost instinctive with us that we are troubled by too pronounced a vocational orientation. It is then that we proclaim, somewhat spuriously, that our programs are first for the whole man, second for the citizen, and only third for the pharmacist, or whatever the vocation may be. This statement of priorities pertains not to what is, or ever has been, but to what we instinctively believe ought to be.

To repeat then, it is my belief that nearly all education, including education for the professions, has been and is largely vocational—and excessively so.

Turning to another of the charges, we are accused of too much concern for specific usable facts rather than broad principles: with excessive preoccupation with subject matter at the expense of proper development of the arts of reasoning and of communication; with too much specialization, compartmentalization, and isolation from related disciplines.

Again, it is my contention that we, in company with nearly all fields of higher education, are guilty—outrageously so. It is incontestable that our courses are heavily freighted with information, with facts, with techniques, with procedures, with how to do something.

It is obvious, however, that such course content is highly perishable, depreciating at rapid rate. Our knowledge clearly is advancing at accelerated pace, with the result that subject matter obsolescence is sweeping over our course contents and study materials, in some areas almost in tidal wave fashion. And certainly this will continue.

A Navy research team has estimated that our fund of technical information is approximately doubling every ten years. This implies that much of what we now think we know cannot possibly be true; that within a decade a significant fraction of the remainder will have lost much of its validity; and within the period of a working life nearly all will have become obsolete and some dangerously fallacious. We know, further, that the magnitude of this obsolescence problem is increasing exponentially and over extended life spans.

Paying lip service to all this, we assert that we are teaching our students how to learn, how to think, how to analyze. But in largest part the facts belie our assertion. Our catalogs testify eloquently that mostly we offer elementary, intermediate, and advanced courses in information—and in the application of known facts to real life problems.

DOES EDUCATION FOR PROFESSIONAL CAREERS REALLY DIFFER FROM OTHER KINDS OF EDUCATION?

I have been urging you to confess guilt to many of the most basic complaints against professional education. At the same time I have been offering you such small comfort as may be derived from the thought that nearly everyone else is guilty too.

Those of us engaged in professional education; however, traditionally

have wanted to believe not that we are essentially similar to others but rather that we are quite unique. On this point—I am now moving onto controversial ground—it seems to me we have done some of our most questionable thinking.

On what grounds do we allege that professional education differs from education for vocations which customarily are not labeled professional? Our claim, it seems to me, reduces to the proposition that the activities of the professions are affected with public interest; that the public, by the nature of the situation, is incompetent to judge whether it is being properly served; and that therefore a high order of social responsibility must be associated with the practice of the professions.

This argument is, of course, valid, but in our kind of society is applicable to numerous other vocations as well. The position of the professional man in a frontier society of self-sufficient farmers would, perhaps, be somewhat unique in this regard. In such a world, each individual is relatively little affected by the activities of most of his fellow citizens but is highly dependent upon the competence and ethics of individual professional men.

In the world in which we live, however, each of us is heavily dependent upon innumerable others outside of the professions. It can fairly be questioned whether you are really more critically dependent upon your doctor, lawyer or pharmacist than upon many others: your airline pilot; the driver of a car approaching you at seventy miles per hour; sanitary inspectors in public markets; telephone company technicians whose competence will make possible securing help in time of crisis; fire fighters and police; newspapermen with power to shape public opinion and affect public policy on key issues; and many more.

If on some catastrophic day in the future an intercontinental ballistic missile carrying a hydrogen bomb takes off from somewhere headed for here, will it not quite literally be true that our very survival will depend upon the competence and social responsibility of what has been done or is just about to be done by millions of people in tens of thousands of vocations? At such a time everyone's education—his technical competence, his dedication to our kind of society, his value system—will in some degree affect the end result. It will be clear that no one's activities are preeminently or uniquely affected with public interest.

Admittedly, the professions have other characteristics beside the one the uniqueness of which I have been questioning. Generally, they have a specialized body of knowledge, established standards, controlled entry, and restrictions upon competition. All of these, however, are at least as old as the medieval craft guilds—remember the story of the opera *Die Meistersinger*—and all presently pervade large sectors of nonprofessional activity within our society.

Summing up on this point, it seems to me that the principal goals of education for the professions are indeed those of preparation for full and satisfying living, constructive citizenship, and competent and socially responsible professional performance. But these same objectives are shared in common with virtually all fields of higher education whether professional or nonprofessional.

LIBERAL VS. PROFESSIONAL EDUCATION

I need hardly remind you that it is fashionable these days to profess belief in a liberal education. Underlying this apotheosis of liberal education, and the accompanying critique of job-oriented education including that offered by the professional schools, are several factors worthy of careful consideration.

First, do we know exactly what we mean by a liberal education? Would we, for example, agree that a program of study including basic courses in each of the following fields would be liberalizing and therefore desirable?

The arts of communication (12 sem. hrs.)

The basic techniques of quantitative methodology (12 sem. hrs.)

The nature of the universe as revealed in basic courses in the physical and biological sciences (24 sem. hrs.)

World history and world geography (18 sem. hrs.)

The social and behavioral sciences (24 sem. hrs.)

Philosophy and ethics (6 sem. hrs.)

Logic and scientific method (6 sem. hrs.)

Foreign languages (24 sem. hrs.)

The great literature of the world (12 sem. hrs.)

The creative arts (12 sem. hrs.)

What reactions do you have to such a program? It would require about one hundred fifty semester hours and might pre-empt considerable time from professional education. Clearly, it could contribute to one's becoming a freewheeling conversationalist of the first magnitude, and certainly an expert at working crossword puzzles. But would it be liberal, or liberalizing?

I doubt this very much. Such an education would, obviously, have breadth. It would provide a wide base of factual information. Also, it would almost of necessity be superficial and, as already suggested, would obsolesce at an appalling rate.

More important, the recipient of such an education might easily be in this situation. He might never have progressed far enough with any subject matter to have experienced any feeling of personal involvement, i.e., he might remain largely unaffected by his educational experience. He might emerge with little or no incentive for continuing self development. He might have no developed opinions about the most desirable directions for change in our society or any matured capacity for leadership in bringing about such change. Although he might be able to describe our world quite well, he might have developed no set of values, no ethical beliefs, no concepts of social responsibility to guide his activities in that world. He might be wholly ineffectual in working with people. And, for want of depth in his educational experience, he might be utterly incapable of thinking through involved problems.

Surely, this cannot be what we mean by a liberal education.

As an alternative program, we might concentrate heavily on some field or several fields generally credited with being liberalizing. For example, the student's program might consist largely of courses in history. Would this be liberalizing? Again, I doubt it. With the right kind of teachers

it might be, but this could be said of any kind of program. It seems more probable, however, that the student would emerge as a narrow gauge specialist with little of what commonly is thought of as a liberal education.

Time will not permit further exploration of alternative curricula to determine their liberalizing potentialities. I can only assert, without proof, what I believe would be probable conclusions from such an investigation if carried to completion. Among these would almost surely be the following:

That no subject matter is inherently and assuredly liberalizing. Any subject matter, from Arabic to zoology and from pharmacy to business administration may when properly presented, have liberalizing effect.

That neither exceptional breadth nor profound depth assures liberalizing result.

That a truly liberal education must be self-extending and self-renovating, i.e., it must contain the seeds or germs for those future changes which will be requisite for maintaining its liberal characteristics in a changing world.

That it must engender respect for the human spirit and concern for betterment of the conditions of human living.

This brings us to the principal thought which I have been trying to develop. It seems to me that the aims of a liberal education, by any reasonable definition, are almost identical with those of any well-designed program of professional preparation.

What capabilities and attitudes are we trying to develop through our professional curricula? Are we not quite well agreed that our graduates should have abilities such as these:

Ability to think logically and to reason through complex problems
Skill in communication of ideas and in working with people
Understanding of our world and the changes taking place in it
Capacity for extending and renovating a fund of technical knowledge
Awareness of problems of ethics and of social responsibility
Possession of a set of values

I submit that these are the core of professional training and that they at the same time are the very essence of what we mean by a liberal education.

ESSENTIAL ELEMENTS IN A COMBINED PROGRAM OF PROFESSIONAL AND LIBERAL EDUCATION

If you accept the thesis which I have advanced, what then follows? It seems to me that this must surely lead us to re-examining our curricula and to making several basic kinds of change.

First, we should minimize the separation of that portion of the student's educational experience which will take place in liberal arts departments from that portion which unfolds within our own professional schools. We should do this partly by having both parts of the education experienced concurrently, all the way or nearly all the way from beginning to end, rather than in strict sequence, i.e., we should not have all the professional courses coming last and everything else over and done with early.

Second, we should recognize very explicitly that the entire process of liberal and professional education must proceed in all parts of the curriculum. Development of the needed capabilities of mind and of the desired attitudes is not something which can be completed before our students reach us—in effect as a prerequisite for our courses. Such mental development must be a clearly recognized objective of every course, professional as well as nonprofessional.

Third, we should think of a curriculum less as series of courses and more as a planned experience designed to develop desired mental capabilities. We should start then, in our thinking about curriculum, not with what we want our students to know but rather with the mental attributes which we seek to develop. We should then design a planned sequence of mental experiences—lectures, discussions, exercises in problem solving, readings, writing projects, laboratory investigations—to achieve this result. We must have subject matter to work with, and this of course will include the contents of the courses needed for our programs. But our emphasis should shift noticeably from this subject matter to the development of the abilities which will be required to self-acquire a quite different subject matter in years ahead.

And one more suggestion. We will improve our chances of achieving the kind of integrated program of liberal and professional education which I have been advocating by filling vacancies on our faculties with this objective in mind. Specifically, I am suggesting that, when a new faculty member is engaged, at least as much thought be given to the non-professional portion of his academic background as to his professional qualifications.

Clearly many other things need to be done if we are to achieve a lasting and felicitous marriage of liberal education with professional training. We need more interdisciplinary courses, and more interdisciplinary faculty groups developing new syntheses of subject matter. We need to achieve much better cross-campus understanding of our program objectives. And above all, we need to have our faculties believe wholeheartedly in these objectives. I need hardly add that none of this will be particularly easy to accomplish.

I must now bring these remarks to a close. I have appreciated this opportunity to be with you. Thank you.

SPECIALIZATION IN PHARMACEUTICAL EDUCATION

L. F. TICE

Increasing specialization has taken place during the last two decades in every technical and professional field and there is little likelihood of any reversal in this trend. There was a time, for example, when a chemist was a chemist and, in his education and training, he learned enough of all the disciplines of chemistry to perform in a competent manner, regardless of the task to which eventually he was assigned. How different is the situation today! There are so many specialized fields in chemistry that no single person could possibly acquire all the knowledge and skills making up the entire field. So highly specialized has it become that even a Ph.D. in chemistry finds highly technical articles on a subject not in his field of specialization almost unintelligible. The holder of a mere bachelor's degree in chemistry, today, is equipped for little else than routine laboratory work or admission to graduate school where he may eventually become a specialist himself.

Medicine is in a somewhat similar position but one which is more analogous to that in pharmacy than is chemistry. Each student of medicine is required to take all of the courses required to equip him for general practice, regardless of what he believes to be his ultimate objective. Specialization requires further education which often is more of the nature of in-service training than it is academic.

Schools of medicine are in a very strategic position to guide and direct graduate education in medicine and the training of medical specialists since most of these specialties are practiced in the hospital of which the medical school is a part or at least closely affiliated.

Schools of pharmacy have an equal responsibility to prepare various pharmaceutical specialists. To do so, however, poses many complex and difficult problems. In the first place, most pharmaceutical specialties other than teaching and research are not usually practiced within the school of pharmacy nor even on the university campus. Courses contributing to proficiency in certain specialized areas of pharmacy may be offered but the services of other schools on the campus must also be drawn upon. Even in hospital pharmacy, it is necessary to utilize—at least for in-service training—the pharmacy located in an entirely separate building and under administrative direction which is sometimes neither completely sympathetic with the objectives of pharmaceutical education nor willing to underwrite some of its costs.

In spite of these and other difficulties, to be discussed later, our schools of pharmacy must not concern themselves solely with the training of pharmacists for retail practice. There seems little doubt that a smaller and smaller per cent of our future graduates will enter this field of pharmacy as their ultimate place of employment. Hospital pharmacy; pharmaceutical manufacturing; pharmaceutical research and development; pharmaceutical sales, advertising, and journalism; and many other fields already lack pharmaceutically trained manpower and may be expected to increase their demands. The truth is that we in pharmaceutical education have failed to provide competent manpower in these specialties. The result has been that many of these excellent positions are filled by chemists, biologists, engineers, and others who, although lacking basic pharmaceutical education, were judged more competent in one

of these specialties. The result has been harmful to the place of pharmacy in the over-all scheme of things, in its recognition, and in its financial support.

We still have too many schools of pharmacy which are so preoccupied with the training of retail pharmacists that all other areas of pharmacy are totally neglected. Conversely, we have a few schools which are so enamoured with their graduate programs that their undergraduate program has been weakened. It is difficult to say which is the greater evil. While it is true that a good graduate program tends to strengthen the undergraduate, this is not the invariable result and it does not result if the undergraduate school is neglected and operated largely by graduate assistants.

The need for specialization in pharmaceutical education seems hardly debatable and even those schools which do little about it almost certainly would not question its need. The real questions concerning it seem to be "Where," "When," "How," and "By whom" should this be given. The Planning Committee for this seminar in assigning this subject asked specifically that it be considered as to the possibilities at the undergraduate level.

Inasmuch as pharmaceutical education is in a period of transition from the four to five year program, most educators in pharmacy must have given considerable thought to how much specialization is possible or advisable under the new program. Some few schools already have an extensive background of experience with the five year program and at least two are on a six year program. While the speaker had certain opinions of his own on the subject assigned him, he was loath to present just his own views on a matter of such transcending importance. Knowing the well-documented abhorrence of deans to questionnaires, he avoided this pitfall and simply by letter asked some thirty or forty deans of pharmacy to express their views on the subject. The response was excellent, which is a rather good indication of the degree of interest in this subject as well as in its relative importance. The most surprising thing about the many replies received was the almost complete unanimity in their philosophy, if not in practice. The speaker wishes to thank his many colleagues for their thoughtful and informative letters. Without them, this would be but an individual expression of opinion and not entitled to a place on this program.

At this point, one is tempted to tabulate in statistical fashion what various schools are doing or plan to do. In this instance, it will not be done since not all schools were canvassed. Furthermore, this presentation should involve not so much the data on what is done as our approach to this problem from the standpoint of need and the educational philosophy which should be brought into play in meeting this need. From the many letters received and their contents, certain clear-cut principles evolved which in their fundamental soundness are a tribute to the progress which has been made in pharmaceutical education in recent years. Here, one cannot help but reflect that only a short decade ago the response would have been a far different one.

The following discussion of the problem of specialization in pharmaceutical education represents a composite viewpoint of the replies received, with some occasional dilution and even possible adulteration and misbranding by the speaker.

There seems to be general agreement concerning the need for those trained in some one of the specialized areas of pharmacy. The part that the school of pharmacy or the university should take in this training is not so clear-cut. Many made the observation that there is a vast difference between taking a course or two which contribute toward competence in some specialized area and

the total preparation of a pharmaceutical specialist. It was repeatedly pointed out that the latter often involves extensive in-service training not available on the campus and of doubtful academic stature for college credit if it were.

Most of the deans contacted were of the opinion that true specialization was impossible within the confines of a five year program without sacrificing some of the basic objectives of the undergraduate training. Here, the speaker is inclined to agree. No student of pharmacy should be permitted to graduate at the bachelor's level without taking all the hard-core professional subjects equipping him to practice pharmacy. It is extremely doubtful whether the undergraduate student can choose and predict with certainty what he will do or be expected to do after graduation. Many a would-be professor or researcher finds himself in a retail pharmacy having been so consigned by either a "C" average or as a result of an early and fertile marriage. He is judged, and so is his school of pharmacy, by his competence to practice with no excuses or explanations accepted. In this, pharmaceutical education is quite akin to that in medicine, and so it should be. Professional electives in a limited amount do have a place in the five year program, but even these can be overdone. This is a hazard well recognized by most pharmaceutical educators. The most frequently expressed concern over this was the danger of forgetting the primary purpose of extending the curriculum; namely, to provide for more general education. Most deans stated that elective hours in the professional years could be better used for additional general education than for professional electives. One dean questioned the introduction of a large number of "splinter" courses of doubtful academic stature and—to use his language—

If we attempt to be too highly specialized, we assume the role of a trade school and inculcate specific answers to specific questions that are pertinent to current practices and we fail to educate for the ability to handle the unknown problems which the graduate will encounter throughout his career.

Most schools do permit the exercise of certain electives to give the student somewhat better training in some special area of his choice. Rarely is this work extensive and the privilege sometimes is offered only those students for whom it seems desirable after careful counseling. For example, a student who is particularly interested in the business aspects of pharmacy may be permitted to use some of his elective hours in the school of business administration; another who is interested in analytical chemistry may elect a course in instrumental methods. By no stretch of the imagination should either then be called a specialist in the field. Even in hospital pharmacy, the undergraduate electives are most often only minimal courses best described as orientation courses.

One problem that has received considerable attention—and deservedly so—is a means of expediting graduate training while still a pharmacy undergraduate. Most schools permit and even encourage promising students to elect additional courses in mathematics, physical chemistry, and foreign language. In some instances, this is done at the cost of replacing some of the general education courses while, in others, professional courses such as pharmacy administration are sacrificed in part. In most institutions, such a modified program is arranged only by the dean or following careful counseling but, at the University of Michigan, a special program titled "Pre-Graduate Study Curriculum" is even listed in their catalogue. Michigan also offers a "General Pharmacy Practice Curriculum" which, by the appropriate use of electives, also provides for some specialization in hospital pharmacy or manufacturing.

A number of institutions report success with an honors program whereby gifted students are encouraged to take added scientific or professional electives or are assigned supervised research. While not specialization in its true sense, this attention to superior students is something in which many colleges and universities have been remiss and which should be given greater attention.

Most pharmaceutical educators seem to agree that no significant amount of specialization is possible while meeting all the basic objectives of the five year undergraduate curriculum. Even those schools which attempt to provide some specialization probably do not achieve any depth in these areas. The six year program is believed to offer definite opportunities for specialization and those institutions having such a program report considerable success in doing so. Here, it is interesting to note that Michigan, sensing the inadequacy of specialization within the confines of the five year program, also offers a six year program leading to the Doctor of Pharmacy degree. This curriculum also is intended to prepare the student either for professional practice including hospital pharmacy or for manufacturing pharmacy. This program is entirely separate and distinct from that offered by the graduate school leading to the Master of Science and Doctor of Philosophy degrees. While these several options at Michigan seem well thought out and planned, many deans in their discussion of the concept of optional curricula seem opposed, the consensus being that some essential core subjects or general education must surely suffer. A careful analysis of the Michigan plan seems highly desirable since it is always possible that the majority can be wrong. Many years ago when a small minority voice in our Association went unheeded, the majority would have done well to have listened. Had they done so, the profession of pharmacy today would be comprised of much better trained practitioners and have greater professional recognition. Whether Michigan is right in this instance, this speaker does not claim the competence to judge, but the plan in operation there should not be dismissed lightly.

In commenting on the several optional programs at Michigan, Dean Rowe cautions that institutions which do not have the staff, facilities, or finances should not attempt it lest they dilute even their main program designed for retail pharmacists.

Some few other institutions also have optional programs but on a much less formal basis, the individual student being permitted certain options following the advice and consent of the dean or the student's advisor.

In summary, the consensus is that:

- I. No specialization with depth is possible within the five year undergraduate program of pharmaceutical education.
- II. Specialization attained at the expense of core subjects or general educational objectives is believed unwise and educationally unsound.
- III. Professional or other electives in limited amounts which contribute to increased competence in some special field are acceptable providing they do not drop to the level of vocational training.
- IV. Courses at the undergraduate level should be of academic stature and not attempt to achieve that which is best gained by in-service training.
- V. The six year professional program and graduate programs are believed by most to provide the only satisfactory means for specialization with such depth as will be a credit to pharmaceutical education.

ACHIEVING DEPTH IN THE SPECIALTIES— PHARMACOGNOSY

ROBERT L. VAN HORNE

The object of this introductory paper is to present some ideas on what is meant by "Depth in a Specialty" and some suggestions as to how one may achieve depth, while at the same time proposing topics for further discussion in the open forum to follow.

Obviously, each of us will have a somewhat different idea of what is meant by depth, how to achieve it, and what measurements may be applied to determine the level of depth which we can achieve in the biological sciences serving the whole of pharmaceutical education.

In casting about for inspiration on the ways of elaborating on this topic, several colleagues in other disciplines were consulted with a view to determining what they construe the meaning of depth to be. One indicated that he thought that depth could not be defined without involving breadth in the area of interest as well as in ancillary fields. He feels, as I do, that one cannot reach a high degree of specialization without concomitantly acquiring a wide scope of both scientific and humanistic knowledge in both related and nonrelated areas. Further, he stated that the mere collection of ideas and knowledge without the development of the ability to rationalize them into an organized concept was indicative of shallowness, rather than of depth.

We must differentiate between depth as a concept of distance, and depth as a concept of the total correlation of thought and ideas into a philosophy of guiding principle. We may compare the work of a microscopist who is examining the contents of a cell by means of visible light or by the electron microscope, and the radio astronomer who is probing the depths of the universe with a radio telescope. The microscopist is dealing with a minute object measuring perhaps a fraction of a micron in size, while the astronomer is searching through space at distances of up to 10,000 million light years. Both deal with depth in a physical sense but at the same time must have the accumulated skills and related concepts which enable each to interpret the observations which he makes. The microscopist considers the components of the cell which are visible through the lens but whose molecular parts have the same relationships in spacial configuration to one another, described as molecular or atomic distances, as do the galaxies of stars which are transmitting the signals in the form of energy changes which occurred thousands of years prior to the observations and which are separated from each other by special distances proportionately as great as the atomic distances in the cell. Yet, neither of these would be able to contribute anything more than a set of data without meaning if he did not have also the ability to relate these data in terms of the whole problem of the study of space and of the living cell.

A common feeling that I observed in discussing this topic with others was that depth in the specialty was interpreted by several persons to mean the scope of knowledge as applied to research. Only one or two considered that it also applied to the breadth and accumulation of training and experience which relates to teaching as well as to research.

It seems to me that the same criteria must be applied to the facts which

are gleaned from the literature, and from our own experiences in preparing and teaching our courses, as are applied to the data which are accumulated from our research, and are used in propounding new ideas or extensions of theories.

In each area there must be both generalization and particularization. There is a marked difference between the simple accumulation of raw data and uncorrelated facts, and in the organization of a concept based on the assimilation and correlation of rational data. Therefore, I should like to consider this topic in terms of the whole intellect of a teacher who is also a researcher, since the same standards apply to both, and one is identified with the other if we accept the consensus of college administrators.

When each of us in this room first became interested in things scientific, very likely it was in a cursory fashion, perhaps being attracted by the activity of insects or the habits of a small animal pet. As time went on and we continued our interests through perhaps a basic course in zoology or botany, we discovered that things were a bit more complex than we had at first realized.

Progressively, we developed more specialized interests, and studied in courses chosen to further our desires for information. Eventually, we were all faced with decisions about whether to continue to narrow down the area of interest or whether to generalize by studying in other disciplines or in the humanities.

This stage was probably reached at about the time you entered graduate school. Here, possibly, if your field was biology, you decided to specialize in microbiology, and eventually ended up in the study of viruses, with your research proceeding along the lines of the effects of very specialized conditions on viruses. At about this time, you found yourself in a very small intellectual box, without windows, as far as any real knowledge of allied biological sciences was concerned. This may seem a bit extreme as an example of specialization but it illustrates a common situation.

This pyramiding of education usually results in a corresponding shrinkage of intellectual interests. This may be all well and good for one who wishes to spend the rest of his life in research—but what about the teacher?

If you are fortunate enough to be employed in a professional school where you are able to teach only advanced, specialized courses in your area of interest, again all well and good. But, how many of us are in this situation? Studies of the requirements for teaching in most professional schools indicate that the teacher often must offer elementary courses in more than just his particular field of interest. Thus, he is handicapped if his training has not provided him with a broader scope of knowledge than we have traced in our example.

The question might arise here: is depth of education in your specialty represented by the number of books in your area on your shelves, and by the number of papers that you have produced, or is it truly evidenced by your ability to adjust your pattern of thinking to accommodate the knowledge that has accumulated in all areas of science and to correctly position your results from experimentation in the total picture?

This question has been examined by Paul Weiss in a study on knowledge as a growth process (1). He recommends that if knowledge grows as organisms do in the intake, digestion, assimilation, and utilization of food, then we should observe healthy dietetics and avoid overstuffing with a glut for redundancy, superdetermination, oversophistication, and other just plain bulk which is no-

ticeable in current research practices. This is described as a syndrome of "soft money" or "projectitis," but is actually a symptom of myopic vision which fails to recognize the true character of knowledge. He recommends further that the whole process of fostering knowledge becomes refocused on penetration and concentration, instead of sheer expansion and bulk. As educators, he insists that we must teach our students and future teachers, not only the present state of knowledge, but also the way in which it has grown up to here, which is the only way in which it can grow further. This is a plea for fundamentalism and well founded speculation.

In the study *The Graduate School and the Decline of Liberal Education* (2) Earl J. McGrath takes note of the tendency of modern graduate schools to overemphasize the production of new facts through original research, to the detriment of a well-rounded teacher whose primary task is the transmission of existing knowledge, the cultivation of intellectual skills, and the development in students of a philosophic view of the whole of existence.

In the words of James B. Conant (3), "Science advances not by the accumulation of new facts (a process which may even conceivably retard scientific progress) but by the continuous development of new and fruitful concepts."

The fact is that conceptual and factual research must interact and support one another.

It is obvious that the results of our research must be correlated into our concepts in our own special areas and will help to keep us alive intellectually, but only if the results are conceptual and not solely a mass of bulk in the form of facts.

In the 1952 Teachers Seminar on Pharmacognosy, in Salt Lake City, Dean Hiner stated the objectives of the seminar, including among others these: the integration of the study of natural products in other professional courses; the encouragement of research and advanced study by students; self evaluation and the development of teaching philosophy. The rest of the week of the seminar was spent in discussing these and other objectives. From this statement of objectives it is apparent that research and teaching are inseparable for the attainment of the highest level of professional teaching skill, and such an accomplishment calls for not only depth of knowledge in a special field but for a broad background in fundamental courses in related, as well as non-related sciences and in the humanities.

Modern knowledge is expanding so rapidly that it is impossible for a person engaged in factual research to keep up to date in the literature in his subject except within certain narrow limits. Yet, he must do this literature-searching constantly or else run the risk of redoing the work of others or of missing their contributions. The college teacher must also keep up to date in new theories and developments in his own and related fields. A later talk in this program will deal with keeping up to date so I will limit my remarks to the previous one in this vein.

As a result of this dual personality that a college professor in pharmacognosy is expected to develop, a dichotomy of purpose results, and this calls for unusual talent in the individual if he is to maintain the proper perspective and accomplish the task of achieving depth as a researcher and also as a teacher. His example

is the one which is closely followed by his graduate students and this influence on the coming generations cannot be ignored.

In order to properly prepare for these responsibilities, it is apparent that the college teacher must be trained in the same fashion as any other professional person. This means that in order to accomplish this fact college curricula and subject matter in the usual graduate program must be expanded beyond the narrow limits now imposed on them; more time must be given to broad study and less to factual research; dissertations must more commonly treat of subjects which require reflective criticism and synthesis of pre-existing facts; and the art of communicating knowledge intelligibly must receive more attention. I should like to reemphasize the last statement. More misunderstanding and wasted time result from lack of communication today than from any other reason. Not only does our command of English suffer, but few of us are versed in any foreign languages to permit full facility in the use of the spoken as well as of the written form. One year is not enough time in which to accomplish this. It is well known that few Europeans claim real facility with a language other than their own with less than six years of continual study. We must agree that Americans are not more gifted in the ability to learn a new language than are other peoples. Cognizance of the need for accelerating our studies of foreign languages and continuing these studies for reasonable periods of time is evident in some of our universities where emphasis is being shifted from the requirement of a bare reading knowledge in two languages for the Ph.D. degree to a minimum of at least four years in spoken and written study of one language. Would that English were studied as thoroughly these days!

We, as teachers, admitting our own shortcomings in communication, can help to remedy the situation by properly directing our undergraduate students as well as graduate students in acquiring the skills and depth of knowledge in the forms of communication in which work is reported. At the same time it is not too late for each of us to continue to enlarge our own abilities in the use of languages.

You will note that I have mentioned very few specific ways of obtaining depth in pharmacognosy in terms of actual subject matter. My reason is that the discussion period in the next two hours will afford time for each of you to offer your ideas on how we may reach new highs in knowledge which is applicable to both the teaching situation and to research procedures. No one of us has a monopoly on the best techniques, and in such an open discussion we are in the best position to profit from all of our experiences.

In the quest for depth let me admonish you to avoid the common trend in our society of attempting to conform to the general pattern for the sake of uniformity. This is also referred to as "togetherness." If you do, you will achieve not only mediocrity but will be lost in the sea of anonymity.

REFERENCES

- (1) Weiss, Paul, *Science*, 31, 1716 (1960).
- (2) McGrath, Earl J., "The Graduate School and the Decline of Liberal Education," Institute of High Education, Teachers College, Columbia University, 1959.
- (3) Conant, James B., "Education in a Divided World," Harvard University Press, Cambridge, Mass., 1948, p. 125.

WHAT CONSTITUTES DEPTH IN ANY DISCIPLINE?

MELVIN R. GIBSON

In answer to the question "What Constitutes Depth in Any Discipline?" I thought of answering with just one word "completeness" and then sitting down. But then with this audience I'm sure I wouldn't have gotten off the hook so easily, and someone surely would have asked me to define "completeness."

To define academic depth or completeness isn't easy. I think either term implies really three conditions: (1) the necessity of organization and possibly of integration of subject matter, (2) an appreciation for the mechanistic organization or integration itself, and (3) the ability to utilize the totality for value judgments including self-evaluation.

First then, depth in a discipline is a body of organized, integrated subject matter necessary to identify the elements of learning experience. These elements are the threads, that is, the warp and woof of the fabric of a curriculum. And just like the warp and the woof, they extend in two directions, vertically and horizontally. The mere depth of anything is only one segment of its possible value. As a pedestrian example, a hole in the ground is limited in its value not only by its depth *per se*, but also by how wide it is—its breadth. Similarly in any educational discipline one does not achieve significant learning by simply vertically adding one course of a type on another course of the same type. For example, one can take Chemistry 1, 2, 3, 4, 5, etc.; one would have chemical information achieved in chemical depth, but it would not be effective depth unless such courses as mathematics and physics were taken at the same time and, of course, some of the more advanced courses would not be possible without auxiliary studies. Hence, depth in an academic sense implies *significant* depth, and *significant depth* is achieved only by attaining sound dimensional growth—breadth.

But mere depth and breadth in planning curricula objectives are not enough: depth and breadth must be achieved by an *organized* plan. For disciplines are not unlike cultures, as recognized by the eminent anthropologist Ruth Benedict in her *Patterns of Culture*: "pathways of culture cannot be ignored. The whole, as modern science is insisting in many fields, is not merely the sum of all its parts, but the result of a unique arrangement and interrelation of the parts that brought about a new entity." Here is seen the influence also of Gestalt psychology with its emphasis upon the forms of experience in which the whole determines its parts, not only their nature, but their relation.

Therefore, without *organization*, learning experiences will be perceived by many learners as isolated, chaotic, and haphazard. Thus in educating in depth, organization is imperative, not as an end itself but for greater effectiveness in learning by increasing the cumulative impact of many individual learning experiences. And in order for education experiences to produce a cumulative effect, they must be so organized as to reinforce each other. Organization is thus seen as an important problem in depth development of a discipline because it greatly influences the efficiency of instruction and the degree to which major educational changes are brought about in the learners.

Further, there is little value of a carefully planned curriculum structure unless students are induced to think, to grasp, and to understand the relationships and meanings existing among the various branches of knowledge, and how to understand how these meanings may be applied to the solutions of all sorts of problems that arise in the discipline, in the daily life of a worker, and in his activities as a member of a family, as a citizen of a community, state, nation, and the world.

Hence, not only must there be a planned combination of subjects to provide depth and breadth, but also must there be an understanding by the learner of the importance and interrelationships of the segments of vertical and horizontal structure of a curriculum. And with this understanding of depth and breadth in all its integrated parts should come a recognition of what is and what is not important—the ability to discern of what in his depth of background is or is not applicable to a given circumstance or problem, what is or is not of value as well as applicable. As Mark Van Doren has commented, "Education might consider its best gift to be the gift of an artistry in difference. The student may be grateful who has been trained to see distinctions in position, distance, color, form, and time; in size and significance; in excellence and justice."

Therefore, depth and its concomitant breadth implies generalness and insight into the integrating and radiating aspects of learning experiences and an understanding of their relative importance and application to a given set of circumstances. And finally, no one achieves true intellectual depth until he sees all of his training, all of his experiences (academic and otherwise) in their true relation to himself and he to them. For, as Milton states in one of his academic exercises: "But let not your mind suffer itself to be contained and circumscribed within the same limits as the world, but let it stray beyond the boundaries of the universe; and let it finally learn (which is yet the highest matter) to know itself."

HOW IS DEPTH DEVELOPED?

EDWARD P. CLAUS

In beginning this phase of the presentation on the subject of "Achieving Depth in the Discipline," I would like to compare the subject of "Depth" with an observation made by Oliver Wendell Holmes that there are one-, two- and three-story intellects. One-story intellect men are those who are mere fact collectors—they have no aim beyond their factual data. On the other hand, two-story intellect men compare, reason, and generalize—they use the labors of the fact collectors as well as their own. But the three-story intellect men are those who idealize, imagine and predict—their best illumination comes from above, from the skylight.

It is my belief that depth can be compared to the heights achieved by the three-story intellects. Depth permits a good teacher to emphasize the prestige of his science and to predict its future potentialities. It enables him to anticipate developments in his field and to plan more efficiently. It stimulates him to accomplish his objectives at the most opportune time. While we generally consider connotations of the word "depth" to be antithetical to those of the word "skylight" or to the phrase "illumination from above," let us for the moment try to visualize some of their similarities. At the same time we may think about how depth (or illumination) may be developed.

An analysis of depth has already been presented by my colleagues. However, to develop depth requires reading, personal contacts and communication, acceptance of speaking assignments, preparation of papers for publication, attendance at meetings and conventions, and participation in sessions which have been described as "brainstorm sessions."

Reading involves studying the contributions of contemporary workers in your own field and in related areas. It comprises the old, traditional concepts as well as the new, modern theories. Knowing the biochemical classification of plant and animal drugs is sufficient information for a one-story intellect man, but a two-story intellect man is able to correlate the taxonomical, the morphological, and the therapeutic classifications with the biochemical. The "illumination" of a system of classification appears when a person can foresee the outcome of research on the chemotaxonomic phases or can objectify the implied relationships of chemical constituents to phylogenetic development.

Personal contacts, as we all know, are tremendously helpful sources of first-hand knowledge on certain subjects that would otherwise skip our attention. A personal communication often gives us pertinent facts and data unobtainable through any other channel. Very frequently, replies to our letters contain descriptive details of an experiment, a method, or a system that we will find invaluable. Talking with someone employed in a specific business, such as the drug supply business, will afford us useful information or interpretations we could not find in published journals and magazines.

When we accept an invitation to be a guest speaker, we undoubtedly prepare for the assignment by extended reading and by searching for illustrations, parallel situations, quotations or descriptive terminology to enhance our message, thus making it more vivid and alive and consequently more interesting and useful to our audience. Using illustrative material such as stories or allegories, employing visual aids such as charts or pictures, resorting to "gimmicks" such as color-producing or noise-making experiments increases our effectiveness as speakers. Each time we contrive a new method of thought presentation, we are most certainly creating "depth."

Preparing a paper for publication entails critical observation of the work of others in the field plus careful analysis of their results and conclusions. To accomplish this efficiently means developing our ability to evaluate objectively which, in turn, invariably results in understanding and tolerance. We become aware of the difficulties others have encountered, and we realize the patience they have exhibited. If we can understand the problem and are able to devise additional experimental methods of accomplishing the same or improved results, we have begun to see the "skylight."

A continuing activity in this direction is attendance at local, district or national meetings and conventions. Although we cannot, for one reason or another, attend all the meetings we would like at the national level, we can participate in many local meetings at which our fellow teachers contribute to the general program. A local botanical or zoological club, a local health agency meeting, or an industrial, chemical or agricultural agents' conference many times will provide enlightening speakers and committee reports on subjects related to our field. These are resources that ordinarily escape our attention.

Finally, the mentally lucrative parley called "brainstorming" that is a feature of many industrial and scientific organizations might well be featured in our own fields. This unstoppering and flowing forth of ideas and thoughts usually produces marked improvements in a method, in a product, and often in human relationships. Maybe your ideas are twenty years ahead of the rest of your fellow workers—nevertheless, express them! Someone once said, "The world is for him who dares to be different!" If we feel we have something constructive to offer, let's air it. Let's clear the film of uncertainty and indecision from the "skylight" and bring our ideas into full illumination. Then we will have achieved "depth."

THE BACKGROUND OF THE TEACHER NECESSARY TO ACHIEVE DEPTH

EGIL RAMSTAD

In discussing the qualifications that a pharmacognosist needs to teach pharmacognosy "in depth," I feel somewhat as I did when I was asked to give a talk on the peculiarities of the Lappish language, never having heard or read a word of Lappish but supposedly being qualified for no other reason than that I was a citizen of Norway. Anyone talking about qualifications for "depth" in teaching pharmacognosy certainly must feel humble in approaching the subject.

Nevertheless, the problem is important. No matter how desirable, no matter what it may comprise, depth in teaching is possible only when the teacher has certain qualifications and demonstrates certain attitudes. Anyone who harbors a desire to teach more in depth must consider his suitedness for the task.

In my opinion, the teacher who aspires for depth in his teaching must first of all have a willingness to sacrifice a great deal of breadth for depth. With *depth* I mean a concentration on basic, unifying principles which underlie the various aspects of pharmacognosy. Or, said in a different way, teaching in depth represents an effort to make the student understand how the facts in pharmacognosy and its different areas are related to other pertinent facts and areas within and surrounding pharmacognosy proper. A collection of unrelated facts, however extensive, does not constitute depth.

Pharmacognosy is the science of drugs of biological origin, excluding, of course, their pharmacological action. The relationships of these drugs to biological systems are of all kinds, and therefore by its very nature, pharmacognosy is by far the widest of all the pharmaceutical sciences. Teaching of the subject requires insight not only regarding a variety of large and important areas of biology, such as taxonomy, morphology, anatomy, genetics, structural, and dynamic biochemistry, physiology, and others, but also some insight is needed into general chemistry, technology, economics, agronomy, philology, history, and others. So broad is pharmacognosy. In fact, some people feel that a familiarity with such areas as pharmacology, pest and weed control methods, and other non-pharmacognostic biological areas are indispensable for the pharmacognosist as well. The best job of teaching probably cannot be done unless the teacher has a reasonable insight into all these areas. But should a *thorough* insight into all these areas be necessary? If so, I am afraid we would find no one to teach pharmacognosy, for it is beyond the capability of one human to master so many diversified fields. But I do not think the pharmacognosist needs to be afraid of the notion that a little knowledge is a very dangerous thing. The auxiliary areas help him to see the implications that exist in his specific material.

On the other hand, half-insights cannot provide the basis for teaching in depth. However, a genius with an inexhaustible store of knowledge is not essential to satisfy our desire for teaching in depth. What is really needed is limitation to a more narrow field whose significance and understanding must be thoroughly and clearly realized by the teacher. Unless he is willing to limit himself to a somewhat narrow area and renounce teaching "the whole book,"

there will be very little opportunity to really penetrate. For instance, if taxonomy is the area where he feels he should teach in depth, he must make a thorough study of evolutionary and morphological principles of the Natural Plant System and not content himself with some superficial remarks on plant family characteristics. In drug anatomy, no depth results from studying a large number of drug sections unless the basic principles of histology and morphogenesis are expounded. To be able to do so, he must be more than an amateur; he must be somewhat of a specialist in this particular area in addition to being a pharmacognosist.

Particularly important is his philosophical outlook on teaching his concepts embodying a purpose and ultimate goals. If his ambition is only to make bricks to order, I do not believe that a teaching in depth can be achieved. There is very little comfort in knowing that one travels fast if one does not know his destination. Without conscious goals and purpose, the teaching becomes empty.

Memorization is not education. One must walk to learn walking. Only by exerting his own mind can the student really progress. Without reasoning on his own the student advances but little. One important qualification of the teacher therefore is the willingness to pose problems for the students and yet not solve all of them.

I believe that a teacher of depth should attempt to teach *for tomorrow*. But of tomorrow we know only that it is going to be different. So much of the older forms of knowledge that often are given to students will very likely be of little significance in the years to come. But basic principles will continue to be important, especially for understanding the new things to come. Naturally, I do not believe that all areas of pharmacognosy are equally well suited for furnishing understanding of natural drugs and furnishing information that will be useful tomorrow. I feel that a lasting understanding of drugs of natural origin will best be provided by acquiring insight into drug constituents and their behavior, their formation and transformation, and the factors that affect their qualities. Problems of genetic or biochemical nature perhaps lend themselves particularly well to so-called teaching in depth, and these seem likely to furnish an understanding that will be most useful in the present and the future.

It stands to reason that thoroughness and insight are more likely to be achieved by the individual who is actively engaged in research himself. He is more likely to be better acquainted with the recent literature and with many basic and detailed aspects of the problems related to his area of behavior. His personal concern and work in a given field is also likely to generate enthusiasm and make him realize implications and interrelationships of many problems otherwise hidden. Research is therefore an important qualification for success in teaching in depth. As a result of his struggle to solve problems and the unavoidable discovery of his shortcomings, he is led, over and over again, to more studies so that he may better understand principles of the sciences that are fundamental to his research.

One who wants to attempt teaching in depth must have the courage to experiment in teaching and be prepared to accept failure. He must have strength to discard more or less obsolete material as new and more significant knowledge accumulates—and it happens fast these days. Unfortunately, what

he chooses may not always turn out to be the most valuable principle or the most useful knowledge.

In the few points that I have discussed I have not been very specific. Because there are so many specialties within the field of pharmacognosy, this would be nearly impossible in the short time. But I think it is worthwhile to realize that, in general, teaching in depth in pharmacognosy does not differ significantly from teaching fundamentals in other sciences. The prime condition is always to surrender the idea of teaching everything belonging to the applied science of pharmacognosy and, instead, concentrate in one or more limited areas; for instance, emphasizing phytochemical, biochemical or any other significant aspect of pharmacognosy. Emphasizing the basic principles and using specific facts for illustrations and explanation should be the prime objective. Then, maybe, when we later consider what we have achieved, we may end up discovering that we have done something truly worthwhile by attempting to teach in depth. Perhaps in this way future pharmacists will feel a sense of gratitude toward us.

THE BACKGROUND OF THE UNDERGRADUATE STUDENT NECESSARY TO ACHIEVE DEPTH IN PHARMACOGNOSY

LYNN R. BRADY

I can not rationalize why I have been requested to express a few words before this group on the background of the undergraduate student necessary to achieve depth. The only thought which comes to mind is the fact that I have been an undergraduate student more recently than most of you. In any event, the next few minutes will be spent outlining the principal features of the background which should be expected of a student enrolling in an undergraduate course in pharmacognosy.

The orientation or attitude of the student toward the course material is a very important factor which contributes to the depth of understanding which is achieved. However, the ramifications of this topic are unlimited and better adapted to a philosophical rather than a factual discussion. Hence, this contributing factor will be acknowledged merely in passing. The knowledge and skills which should be at the immediate command of the undergraduate student, if he is to attain more than a superficial appreciation of pharmacognosy, will be presented briefly.

At this time it should be mentioned parenthetically that for this discussion the background necessary for the student to achieve depth is measured in terms of a certain level of accomplishment. In most cases no recommendation is made regarding the amount of time a student should spend accumulating this background. The means which are employed to acquire this essential knowledge are only incidental to its application for the achievement of depth in pharmacognosy.

The student must have a good command of the English language. The student who can not read with a high degree of comprehension, and then express his thoughts in well-written paragraphs, will not achieve depth in pharmacognosy.

The student should have a well-developed capacity for reasoning. This ability is most readily developed by many students through mathematical training. In fact the value of the development of a habit of this type of mental calisthenics is a major factor in favor of encouraging a student to become competent in mathematics through calculus.

The basic principles of physics are essential for the student to understand the manipulations which are involved in purification and assays of active constituents, or to justify the techniques which are used in harvesting and processing volatile oils.

A working knowledge of geography and history is essential if the student is to attain a significant level of depth. There is not sufficient time in the undergraduate courses to consider in detail the historical development, distribution, and cultivation of medicinal plants; and the influences of these plants on the economic and sociological lives of native peoples of the world. The student

must use his previous knowledge and a minimum amount of supplementary reading to obtain a depth of understanding. A failure to consider such factors, at least briefly, leads to a superficial collection of facts without the integrated comprehension that is characteristic of depth.

The student should have a good basic knowledge of biology, especially botany. This should include a general knowledge of gross morphology, plant anatomy, and plant physiology. A general understanding of the principles of taxonomy is desirable, but not essential, for the undergraduate student in pharmacognosy at the present time. However, nomenclature is a significant part of the undergraduate program; so, the student should be familiar with the salient features of the International Rules of Botanical Nomenclature.

In this era of broad spectrum antibiotics and polio vaccines a general knowledge of microbiology is *a priori* if a student is to attain a depth of understanding in the phases of pharmacognosy which are associated with these preparations. Likewise some knowledge of vertebrate physiology is necessary to relate active constituents with potential therapeutic applications.

The present biological emphasis in the teaching of pharmacognosy requires a student to have a solid background in organic and biological chemistry. The student should have a minimum of a year's training in organic chemistry and all of the biochemistry that his program will permit. This is necessary to obtain an adequate background. Without such a chemical foundation the undergraduate student learns isolated facts and does not grasp even the most rudimentary concept of plants as integrated biological systems which are capable of forming chemically complex, physiologically active constituents.

This is an outline of the background which I feel is necessary for an undergraduate student to achieve true depth in our discipline.

ACHIEVING DEPTH IN PHARMACOLOGY INTRODUCTORY REMARKS

EWART A. SWINYARD

The topic under discussion is "Achieving Depth in the Specialties." This topic is particularly important to pharmacology, because pharmacology is one of the youngest of the professional disciplines in the pharmacy curriculum. Hence, we have had only a comparatively short period of time in which to integrate the biological sequence into the pharmacy curriculum and to elevate the instructional level of pharmacology to the position demanded by modern pharmacy. Furthermore, pharmaceutical administrators have been slow to take advantage of the prestige an active department of pharmacology can bring to a college of pharmacy. Indeed, many administrators, previously satisfied with service courses from outside their college, are now making serious attempts to establish departments of pharmacology within their own colleges.

If we are to assure that pharmacy students acquire an understanding of pharmacology commensurate with the present and future demands of their profession, it is our responsibility as teachers of this subject to make sure our own courses in this discipline reach the desired level of excellence. Therefore, I hope all of you will take advantage of the opportunity afforded by this workshop to exchange ideas and will share freely with us your experiences in achieving depth in this area of instruction.

Several pertinent questions might be asked at this time merely to stimulate your thinking. What are the minimum prerequisite courses necessary before we can teach pharmacology at the desired level? Precisely what should we teach the pharmacy student about pharmacology? How much detail should we expect the student to retain with respect to mechanism of action, pharmacological effects, fate and excretion, uses, and toxic effects? Are our examinations geared to the level indicated by the material presented in class? Are there particular areas of pharmacology in which the pharmacist should be especially well grounded? On the other hand, are there particular areas which are of little concern to the pharmacist?

To most of you, the above questions are "old hat." You have discussed them many times, but generally, in a cursory and idealistic fashion. I would like to suggest that we approach these questions on a realistic basis; that we consider what is being done and what we should do within the limitations of the five year curriculum.

Perhaps some of you have developed special technics which are valuable teaching tools. At the University of Utah, for example, we devote the third quarter laboratory time to the determination of unknowns. Each group of four students is given a solution of an unknown drug and is expected to identify the substance or at least to determine its pharmacological classification by means of biological technics. This procedure not only gives the students valuable laboratory experience, but also encourages them to review the fundamental principles of pharmacology. The students report their findings to the class and re-count the experimental evidence which supports their conclusion. Our students thoroughly enjoy this experience and are enthusiastic about its teaching value. I am sure many of you have had similar experiences. Now is the time to share them with others. If this is done freely, we shall all benefit from this workshop.

ACHIEVING DEPTH IN PHARMACY ADMINISTRATION

STEPHEN WILSON

Our general subject for today is "Achieving Depth in Education," and this afternoon we are to apply this specifically to our various specialties. So, our immediate topic for this workshop becomes "Achieving Depth in Pharmacy Administration." In general, we base our discussion on the broad foundations laid down for us by the speakers at the general session this morning: "The Delineation of the Professional Disciplines" by Louis C. Zopf, "Education for Depth" by Lawrence D. Coolidge, and "Specialization in Pharmaceutical Education" by Linwood F. Tice.

Generally speaking, a person achieves some depth when he earns an advanced degree by taking graduate level courses and doing some research. He achieves greater depth when he organizes, develops, and teaches advanced courses and directs research on a larger scale than could be done on an individual project. Still greater depth is achieved by evaluating actual experiences in terms of basic principles and deriving new relationships and hypotheses which may eventually be recognized as new theories and may even lead to a new principle. This requires both an active participation in the daily work of the community and thoughtful concentrated contemplation in evaluating the actual experiences. The greatest degree of depth is achieved when what we discover transcends our specialty and is found to be a basic philosophic truth or an evaluation of human values for mankind.

However, I do not wish to dwell on this at length. I would rather point out some guideposts which should be observed along the way as we proceed to achieve depth. First of all I would like to point out that our field of specialization is unique in that it is the only one in the pharmacy curriculum which belongs in the social, rather than the physical sciences. This is bound to cause difficulties and misunderstandings, especially if it is included, along with all the pharmacy courses, in a physical science division in the organization of the university, and separated from other divisions such as the social studies and the humanities. Our physical science colleagues are, of course, aware of the different nature of the social sciences, of the great multiplicity of the variables, of the greater difficulty of controlling these variables, and of the practical impossibility of re-creating situations under controlled conditions. But awareness of these differences from the physical sciences does not bring complete understanding of our problems. We ourselves seldom realize that even a slight change in any one of an almost infinite number of variables might completely alter a problem under discussion. I am sure you all recall, from classical economics, the discussions on the equilibrium of supply, demand, and price. In an immediate situation if the supply is short, demand becomes the dominant factor in determining price. In a long term consideration, however, the supply can be adjusted to the demand, whatever it is, and supply becomes the dominant factor. The mere changing of the time factor involved reverses the situation.

The most important thing for us to emphasize here this afternoon, however, is that as we move toward achieving depth, we must do this in an overlapping area of two disciplines: pharmacy, in its over-all inclusive sense, and business

administration in its broadest sense. The most basic concepts of both must be maintained, and careful evaluations must be made whenever they appear to be in conflict. For example, last August, at the Education-Industry Forum held at Princeton, one of the teachers in attendance there stated that he taught inventory control and the promotion of a better rate of stock turnover by restricting the number of brands carried in stock, and asked if it were being suggested that he should not teach this. The answer to this query was that no such suggestion was being made. Let me point out, however, that neither the question nor the answer achieved much depth. Of course we teach inventory control, and stock turnover! And these can be applied in the traditional "short term" business way for some merchandise. But for medication dispensed on prescription (whether legend or non-legend drugs) a long term consideration should prevail. To most objective observers the most cogent reason why physicians should not dispense is not that they are not qualified, or that the practice usurps a function rightfully belonging to the pharmacist, even though these may be true. The most important reason is the fact that when a physician dispenses, too frequently the patient receives, not the best medication possible, but what the physician happens to have available from his limited assortment. One of the basic services that pharmacy has traditionally rendered, then is full freedom of selection of that medication the physician considers to be the very best for the individual patient. Therefore, in the case of prescription medication, our full background of knowledge and techniques concerning inventory control and turnover should be spotlighted on helping the pharmacist present as complete an assortment as the needs of the physician and his patients require, and establishing the inventory and turnover controls to enable him to do this within the realm of good business practice from the long-term point of view. This is simply another way of saying that good professional practice comes first and in the long run is synonymous with good business practice. Pharmacy will never be successful if it disregards its professional and public health responsibilities for short-term profits.

Our job, in this evolving discipline of ours, is to interpret the principles of business administration in its broadest sense, so as to guarantee the fulfillment of the professional and public health responsibilities of pharmacy. This is where we can make our greatest contribution. If we are going to overlook this essential point, we will serve no purpose, and will simply be doing what instructors from business administration could have done, long since. Years ago pharmaceutical education rejected that approach, and has been waiting patiently for us to develop and to merge the two disciplines where they overlap. Let us not now settle for what pharmaceutical education rejected years ago. Let us rather foster our specialty, and by achieving depth, raise it to new heights.

KEEPING UP TO DATE

KEEPING UP TO DATE: THE RESPONSIBILITY OF THE PROFESSOR

MARTIN BARR

When I was asked to discuss this subject, the Planning Committee for the General Seminar suggested that I point out how and why professors in pharmaceutical education should assume the responsibility of keeping up to date and how to convey this attitude to students at the graduate and mainly the undergraduate level. Naturally I accepted with trepidation since I knew that a great many of the educators in the audience would be more qualified to speak on such a subject than I. May I bring to your attention the opening remarks of Dr. R. R. Armacost, Purdue University, in his talk on "Fundamental Teaching Concepts" delivered at the last General Seminar in Pharmaceutical Education held at Butler University in 1955. He said:

I can't teach you to teach. If I had this ability I too would be a better teacher. But I do think I can give you a prescription for good teaching. The effectiveness of this prescription, like that of any prescription, depends on the physiological and psychological state of the patient. For one thing he must not be allergic to teaching suggestions. As you well know, allergies frequently make it impossible to prescribe other ingredients. I hope none of you leave after this speech with the hives or even an antagonistic touch.

I believe you will agree that these remarks are as appropriate today as they were when delivered five years ago.

Let us consider the present day challenge of pharmaceutical education with which we are all involved. As I see it, the basic purpose of undergraduate education in pharmacy is intended to prepare men and women so that they may engage in the many varied areas of this profession. Of course you are all acquainted with the definition of pharmacy recently developed by a joint committee of the American Association of Colleges of Pharmacy and the National Association of Boards of Pharmacy. It is as follows:

Pharmacy is that profession which is concerned with the art and science of preparing from natural and synthetic sources suitable and convenient materials for distribution and use in the treatment and prevention of disease. It embraces a knowledge of the identification, selection, pharmacologic action, preservation, compounding, analysis and standardization of drugs and medicines. It also includes their proper and safe distribution and use whether dispensed on the prescription of a physician, dentist, or veterinarian or, in those instances where it may be legally done, dispensed or sold directly to the consumer.

When we break down this definition into its components, we recognize the immensity and challenge of the task. We realize that pharmacy is a profession which involves many disciplines. Shall we as educators concentrate all of our attention on chemistry, on pharmacology, on dispensing? Actually, all of these subjects and many others must be in our command. We must bear in mind that a great number of our students will practice in varied situations. A large number of them will be pharmacists engaged in the filling of prescriptions in those communities where they choose to practice their profession. In this capacity they will have the responsibility of advising their customers and various members of the public health team on health matters. Some will practice as hospital pharmacists; others will engage in research; some will enter government service; and a few will join with us in the art and science of teaching pharmacy.

A small number of our students will find employment as manufacturing pharmacists; some will enter the business of wholesale pharmacy; still another group will represent the pharmaceutical industry as professional service representatives perhaps ultimately to become policy makers for major pharmaceutical firms.

Any educational program which has as its objective the training of its professional members for so many diverse fields as the relatively few I have mentioned is challenged by an up-to-date participation in all matters in which the student may be involved.

In September of 1960, all colleges of pharmacy will institute, if they have not already done so, a minimum five year curriculum. The reasons for this lengthened curriculum are well known to us and need not be considered here. We as educators in the various branches of pharmacy have an increased responsibility for providing the most modern and up-to-date courses of study for our students.

For the first time in the history of our profession, we will have as students young people who have had far better basic training in the humanities and in the basic sciences. Thus we start with a debit and a credit. As part of the debit we are charged with the responsibility for the stimulation of these young people to the greatest fulfillment of their potential. Our challenge lies in the fact that we will be dealing with more sophisticated human beings.

I am reminded of a definition of sophomore and sophisticate which was given to me by a friend. It was his feeling that a sophisticate is a sophomore and a sophomore is a freshman slightly sophisticated.

In other words, we will be dealing with men and women who are not yet fully matured, yet some of whom will come to us with a feeling that they have matured beyond us. As educators, our greatest responsibility lies in the fact that we must by precept and example lead these young people into the difficult habit of keeping up to date with a rapidly growing profession and philosophy.

It is only by precept and example that we shall teach these young people how to keep up to date. Need I tell you, members of this seminar, what this means. You all know, as I do, that one keeps up to date through sacrifice of time and personal interests, by careful and constantly maintained interest, dedication and self-discipline, and through the persistent evaluation of all new findings which are pertinent to our profession and the changing techniques required for teaching it.

We have been told that the Russians have surpassed us in the teaching of scientific subjects. It would seem that they pay superior students to develop and maintain superiority, and some have felt that this is where our American educational system has failed. This explanation is at once too glib and incomplete. No one can be bribed into superiority and accomplishment. It is only by inspiration that we can lead and teach.

I am sure that all of you have experienced the wonderful spark that leaps from one's most inner teaching efforts to the occasional student; surely most of us have experienced this as students. I can recall the occasions when I was led to emulate teachers who at various times during my education had reached

through to me. Of course it is extremely difficult to evaluate and to analyze what it is that causes these breakthroughs.

We are then confronted with a definition of the word teacher as it pertains to the profession of pharmacy. What constitutes a good pharmacy teacher? It is someone who has a little knowledge of the basic principles involved in pharmaceutical education and a great deal of enthusiasm? This was perhaps true in the distant past when the training of most educators was mainly empirical. There was very little that could be published in the literature in those days and some of the educators may not have had sufficient scope of vision and informational background to truly appreciate worthwhile contributions in print. Indeed, in those days, this was true of many other professional fields of education. Actually I think you will agree that during the last two decades, the training of pharmaceutical educators has improved considerably, and it continues to improve. Today, practically all of our educators possess graduate degrees indicative of advanced scientific training, and they are in a better position to evaluate newer developments than their predecessors. But graduate training alone does not of itself produce a good teacher. In fact, one of the problems of pharmaceutical education today seems to have been created by the teacher studying for or possessing advanced degrees who has little desire to teach.

Teaching should be more than a meal ticket. The teacher must possess ability and also an inner urge to communicate interest and stimulate students.

Indeed some of the leading educators of today could not in their time avail themselves of the opportunity to obtain advanced training. Yet many of these people have become shining examples of the excellent teacher who became successful because of willingness to dedicate the countless hours required for the process of keeping up to date. By their precept and example, they have pointed the way for many of the younger educators.

A few words on the significance of the conducting of research by teachers of pharmacy are in order. Interest in research is of great value not only to the teacher but even to the undergraduate student who has a quest for information. The performance of research is a most important process which can be utilized by educators for keeping up to date, even if the study being investigated is not closely related to the subject matter taught by the teacher.

We all recognize that there are research scientists who are not good teachers. There are conscientious teachers who may not be research workers. A conscientious teacher, however, can and should develop an interest in research and carry out investigational studies as one of the major means of keeping up to date. Often the stimulation obtained by the educator as a result of his own research is responsible for the desire of a student to pursue graduate studies.

Yet when we return again to an analysis of good teaching in pharmacy, we are confronted with the fact that some people tend toward a constant study of all the new scientific matter pertinent to pharmacy. Others have a specific interest in the changing pattern of pharmacy as it is practiced by the majority of the members of our profession in the community pharmacies. It would seem to me that a synthesis of both is vitally necessary. How else can we convey to our students the changing patterns of this profession which has been so completely revolutionized in the last twenty years? Is it not part of our

responsibility to awaken to those changing trends, some of which have been helpful, some harmful? In other words, how can we stimulate our students to think constructively and professionally and to deal with the public so that they face the challenges with which they will be presented once they enter the actual practice of any of the many manifold areas of pharmacy? Let us not forget the words of Henry Brooks Adams who said:

A teacher affects eternity; he can never tell where his influence stops.

These are wise and profound words indeed.

Twenty years ago, in an article published in the *American Journal of Pharmaceutical Education*, Robert C. Wilson said:

If the independent pharmacists of America are to assume their full responsibility to serve as educators and counselors of the individuals whom they contact, it becomes the obligation of the teachers of pharmacy to so inform the students that they will go into the profession with a full comprehension of their duty to teach.

In summary, keeping up to date as educators is hard work in itself. In the field of pharmacy, the task becomes increasingly great. Ours is a profession of increasing responsibility due to the many advances and frequent changes. The public relations aspects of pharmacy become more difficult to understand and cope with so that we are now required to keep up to date in all of the many areas of technology, public relations, and teaching techniques. In brief, I believe that we must direct more thought and more of our energies to a constant study of all these matters which pertain to pharmacy as a profession. If we can be pliant in our acceptance of new and challenging points of view, if we can drop old concepts regardless of how dear they may be to us when new and better ways are found, most particularly if we can maintain a constant awareness of these changes, I feel then that we will be better armed to fulfill our obligations as teachers to the pharmacists of tomorrow. It is only by precept and example that we can awaken the same questing attitudes which we so much desire.

KEEPING UP TO DATE: RESPONSIBILITY OF THE ADMINISTRATOR

H. G. HEWITT

No one could have been more surprised than I was when I was asked to present this topic. I feel certain that many others in this audience would be better qualified to do so. This is neither here nor there, for you now have no choice but to listen.

THE ADMINISTRATOR

Let us admit, at the onset, that the perfect administrator does not exist. He cannot. He is a contradiction in terms—he must be all things to all men. To the president, he must be a practical dreamer. To the comptroller, he must be a miser, husbanding the funds wrung from an economy-minded legislature. To the staff, ideally, he should be Lorenzo the Magnificent, lavishing the gold of truly rewarding salaries, fabulous equipment, and increased leisure time upon them. To the student, he must be a Machiavelli who can interpret any given regulation in such a way as to extricate him from his current dilemma.

Let us first characterize the administrator and then try, in brief, to define his duties. From these facts we can develop our thesis.

The successful administrator should be a man of reasonably mature years, one in good health with considerable vigor and stamina and have developed balance, poise, and sound judgment. This leader must be a man with active imagination, who can not only plan for the future of the school, but be able to translate his dreams in a lasting form. The successful leader must be a person of balanced judgment, who can judge men in selecting his staff and one who can resolve differences among them. He must be constantly aware of the value of good public relations, and he must be able to develop a favorable reaction toward his school by students, faculty, alumni, prospective patrons and, of course, the various philanthropic foundations, as well as the general public.

It must be remembered that the principal responsibility of this administrator is to administer the program. This must be the chief demand upon his time; he should not be a part-time director. Only he who has moved from teaching into administration realizes what a radical difference is involved. Basically he must set up goals to be reached, identify beyond misunderstanding the roads by which these goals can be gained, and then see to it that the path is followed. He must develop procedures to facilitate learning; develop a staff; advise with this staff; interpret his school to staff, students, and the public; prepare budgets; and provide funds, equipment, and facilities. In brief, the administrator is charged with the process of integrating staff efforts so that a desired result is obtained.

THE ADMINISTRATOR'S RESPONSIBILITIES

It seems to me that "keeping up to date" is largely one of maintaining good communication between administrator and the many segments of his constituency. This is true whether it involves the teacher, students, practicing pharmacists, or the general public. Failure to maintain adequate communications is usually at the base of all friction or misunderstandings.

By communications I do not mean the mere supplying of information through the many media available, but rather a united effort when persons or groups face a problem or experience together. In educational procedures it should be the sincere effort of the administration to listen to and to understand the other staff members' ideas or their interpretation of the problem. When the two parties successfully strive for agreement and accept new ideas brought to light by the question at hand, the result should be an increased awareness which should in turn lead to resolving the issues in a way satisfactory to all.

The "climate" of the department or school is one of the more important factors in the development and the maintenance of the morale of the staff.

What the members of a department represent individually and collectively, their attitudes and their actions, have much to do with this general climate. A temperate zone of tolerance, mutual understanding and a feeling of unity will keep staff members satisfied to remain on the staff and attract new members to it. This atmosphere can be felt by the casual visitor and should be easily detected by the administrator. Such a climate which encourages scholarship, offers professional growth, and assures academic freedom is that climate in which a strong staff flourishes. The atmosphere which supports cliques or tolerates dilettantes cannot expect to hold or attract top-rated teachers.

A good administrator must be interested in the progress of each of his staff members. He must keep up to date with his research activities, his campus and community participation, and in all ways be acquainted with his professional growth.

One of our greatest difficulties stems from the assumption by top administration that the other administrators have communicated matters of policy or procedure to their respective staff members. All too often this is where the line of communication breaks down with the resultant misunderstanding and dissatisfaction which is found in most schools and colleges. It is an old army saying that a complaining army is a good army. Maybe so, but I feel this should be present in our staff relationships to only a very minor degree.

An effective administrator, in keeping up with staff activities and through proper communication, does establish the tone of the environment. Every administrator must understand the conditions under which a teacher and a researcher can best operate. It is his responsibility to supply them with the equipment and create the conditions under which teaching and research not only exist but also flourish.

Administration today, keeping the organization functioning, has become so complicated with the many time consuming tasks of "running the show" that the administrator has far too little time to keep up to date in his field of specialty or in many of the important educational issues facing us today.

These difficulties will be all the more aggravated by the academic population increases that are with us, and will become more troublesome with the approach of the seventies. Here truly is a problem: facing the issue of doubled growth with its attendant dangers. Certainly there must be increased facilities, laboratory and library alike, far better salaries and increased expenditures for modern teaching and research equipment, along with added secretarial and teaching assistants. This alone will not solve our problems. Added manpower must be trained; modern methods of teaching, such as closed circuit television,

must be studied to aid us in facing this numbers problem. With added staff, of course, comes greater need for developing more effective methods of communication between administration and staff. With every move to effectuate better communication, we can more efficiently bring the two parts of a successful team together. Accompanying this reduction in the gulf between the faculty and the administration, we can make more effective use of our teachers' talents and reach the goal of the desired high morale.

SELECTING A STAFF MEMBER

Certainly great care should be used in selecting a new member for the staff. Knowledge of his subject is vital but a personality that will make the candidate acceptable to staff and students alike is almost as important. Incidentally, one should not overlook the value of a well-adjusted wife who will be happy in university circles.

An administrator, careful as he may be in seeking out a candidate who he believes will serve the institution well, makes mistakes. We can only guess from the contents of a curriculum vitae and recommendations; even a personal knowledge of the candidate may fail us.

One should view the addition of a new member above the rank of instructor as a permanent acquisition. It is very unusual that a professor is separated from his position except by his own choice. For this reason much time and care must be employed in seeking out the right candidate for the position. Unlike education, a business firm selects its employees with somewhat less care, knowing that it can eliminate the incompetent upon short notice. It is true that universities have probationary periods before the granting of tenure. Tenure once granted can be good or bad for the institution. Ideally, it should furnish that freedom from anxiety over the future which enables a man to give his best effort. Unfortunately it sometimes allows the lethargic to settle back and put his feet up on the desk. Let us not allow our ivory towers to become sanctuaries for incompetents.

PROMOTIONS

It is most difficult to equate those activities and factors which are considered when we are called upon to recommend merit increases or promotions. Here is truly a place where keeping up to date with staff practices is a definite must. It does not follow necessarily that teaching and research are incompatible. It certainly is not true, as is often expressed, that a good teacher is a poor researcher or that a good researcher is a poor teacher. Happy is the administrator who finds both qualities of excellence in the same individual. It is true that the excellence in scholarship and research brings distinction to our schools. Such practices should be encouraged. This, however, should not be the sole criteria for promotion. The single standard of "publish or perish" should be modified to recognize other values to an institution. Excellence in teaching, superior field service, and other public relations responsibilities cannot be overlooked. We must give more than lip service to the desire for good teaching. Most of our staff members like to teach but are faced with the thesis of "promotion by publication poundage."

Any conscientious administrator is anxious to keep up to date on the teaching success of members of his staff. This is true as previously stated not only

to encourage good teaching but also to reward it. He is likewise interested in helping those teachers who have teaching handicaps to recognize and overcome them. He realizes that students and former students are in a position to form judgments on these matters from direct experience. It is therefore important that this evaluation, along with other facts be collected periodically. A relatively impersonal rating can be taken among the members of the most recent graduating class. This evaluation is most interesting and helpful. Such information as the teacher's knowledge of his subject, his presentation of the material, his enthusiasm for the subject, along with his sense of humor and proportion, his personal and professional appearance and mannerisms, and finally his attitude toward his students, should all be in each teacher's profile folder.

Another excellent way to keep up to date on the abilities of his staff members is to place their talents to good use in developing long range planning in curriculum developments, etc. While the content of the particular courses of study in our curriculum is the faculty domain, it must be remembered that there still must be administrative control over the direction which the program will follow, course costs, the evaluation as to the realization of the school objectives, and, finally, the actual administration of the program.

In keeping with our times we must study the changes which result in greater efficiencies in our calendars, our schedules and our teaching techniques, and our administration procedures.

There is no doubt that acceleration in programs will increase in our schools: the trends toward quarter and trimester plans are now evident. Recognition of differences in ability can result in accelerated programs for the superior student in particular. Some variations in programs adjusted to the speed of the individual student are indicated whether for the average student or for the good and superior student. The mere acceleration for acceleration sake, with every student following the same pattern, is not the answer. While higher education is costly and becoming more so each year, getting students out in shorter periods of time does not justify such programs. Financial expediency alone should never dictate academic policy.

It is not for us to place emphasis upon more professional courses solely because we are entering the five and six year program. Our aim in developing these new programs should not be merely to place emphasis upon the materialistic aspects of our training—teaching solely the skills in the art and science of pharmacy. We must train these students "to live" and to be able to "make a living." This I believe is one of the more important tasks in keeping up to date in designing our curriculum for those who will practice the health arts in the twenty-first century. Periodic content reviews and the validation of our curricula, as well as the testing of the objectives which each school establishes for its program, are most necessary. Periodic "stock taking" is more important in education than it is in retail pharmacy.

QUALITY TRAINING

In the years immediately ahead, the press of numbers can lead to some disastrous results, if administrative officers are not careful and do not keep up to date on educational procedures and practices. The quality of instruction

may be diluted. It is an old axiom that has some truth in it, that the quality of education goes down as the student-faculty ratio goes up.

It is true that small increases may not be measurable but there is a point beyond which the best interests of the student are not served. There is a point on the curve at which we reach the ratio beyond which we cannot go or else instructional dilution will occur. Naturally this will vary with each course and we cannot arbitrarily set a figure, as say twelve to one or thirty to one. We must be practical in evaluating the effects beyond which we lose the values of the "give and take" between teacher and student, where there results many fewer written assignments and more of the modern objective exams. This later is most disadvantageous for all too often a student goes through college without learning to write coherently. There is no opportunity for the development of his critical and creative facilities, and he fails to learn to organize and clearly express his ideas. It is to be regretted that in the larger groups we lose the ability to motivate—the means by which we can recognize students of varying ability. It is here that the gifted student loses out in that he is uninspired and works much below his capacity. Far too often they change to other departments where their ability is challenged.

With this prospect of more students per teacher, the problem of self motivation of our students assumes even greater importance. We must so present our course material as to reduce "spoon feeding" and develop in our trainees the desire to keep on in their professional learning. This is the true hallmark of the right kind of collegiate experience. It is here that an administrator should seek to develop interest in professional learning through assigning our best teachers to the first year students. We should not allow our graduate trainees to run over these embryo scientists on their way to reach their research bench.

The proper academic climate sought by good administrators cannot be obtained unless the curriculum is designed to challenge our students' scientific curiosity, encourage problem solving, and develop in them a curiosity about other basic disciplines as well.

It is the responsibility of the administrator to protect that atmosphere which is most conducive to scholarly activity. This "climate" cannot be wished into being or legislated into existence; it must be created through the proper selection of students, the guarantee of adequate library facilities, creation of proper study conditions in the dormitories, and through efficient use of teaching personnel.

If possible, although it is becoming increasingly more difficult, administrators should reduce the time staff members must spend in doing secretarial and clerical work as well as other academic housekeeping chores.

THE STUDENT

Let us not in handling large numbers of students consider them as mere IBM entities. Intelligent counselling is an essential adjunct to good teaching. Impersonal handling of our students may result in failure to recognize his dignity as a student or his integrity as a scholar. It is doubly important that we serve as understanding counsellors.

In promoting this personal interest it is the responsibility of the administrator to keep up with the successes as well as the failures of our students.

An active faculty-student council should be directed by a respected and honored member of the staff. Suggestions from such mature "give and take sessions" should not pass unnoticed by the administrator. Here is a definite place to further and develop our lines of communication. All too often it is here that a serious failure results. It is my opinion that an understanding and satisfied student body is a loyal undergraduate group which in time becomes a loyal alumni.

Recognition of extracurricular successes as well as scholastic should be part of the administrator's keeping up with the student group. A letter of congratulations upon winning honors, athletic or non-athletic, should go not only to the student but to his parents as well.

The student who receives a prize or a scholarship from friends of our schools or from companies or foundations should send notes of thanks to the donors. It is our custom to have the student send us a carbon copy of these letters just to make certain that they have carried out this important assignment.

We should encourage wherever possible the participation in the extracurricular activities presented on the campus. There must, of course, be a balance initiated through self discipline so that the student does not invest more energy in the activities than he does in the classroom. There is always a real danger. We should not, in spite of this danger, lose sight of the fact that extracurricular activities can be a positive force in the well-rounded education.

One of the best opportunities presented to deans to carry out a real selling job for pharmacy occurs at the time he interviews prospective students, and at Connecticut we feel every prospective student should have a personal interview. At this interview we encourage one or both of the parents to be present.

Here is a golden opportunity to discuss not only the opportunities but also the difficulties that may lie ahead in the adjustment of their son or daughter to the demands placed upon them in professional training. It is made perfectly clear that this new learning experience is not just a transfer of old habits developed in high school to another building in another town. The fact that very few students who come to us know how to study is made clear. This necessary adjustment added to that of generally poor reading comprehension and inability to budget their time constitute the "freshman diseases" of the new college trainee. We should not fail to present the various paths leading to the many vocational outlets other than just that of retail practice. Here the challenge for the exceptional student can be shown in the opportunities that are ahead in research and in teaching.

These interviews are very time consuming but are vitally important. At our school each interview consumes not less than thirty minutes and more often a great deal longer. These interviews present a perfect opportunity to do a good public relations job for our profession. Our interviews end with a tour of the building. The student and parents alike leave feeling that pharmacy is a vocation that offers a tremendous future. I cannot overestimate the real dividends that come from this time consuming practice.

We feel that carefully selected students, upperclassmen, can do a valuable service to their school and profession, and at the same time gain excellent experience themselves by appearing at "career" or "college" days at high schools.

Usually these students should be accompanied by a staff member or the dean. Their brief talks to interested groups should be accompanied by movies or other audio-visual aids and literature for later reading. They should bring back names of interested students and the dean should write to each of these students, inviting them to the campus to see the school, and to further discuss opportunities in pharmacy.

During these visits to high schools, the staff members can do an invaluable service to pharmacy by bringing guidance counsellors, principals, and other teachers, as well as students, up to date regarding the many facets of a career in our health profession.

THE CLIMATE FOR RESEARCH

Certainly it is paramount that without a favorable intellectual climate graduate and research work cannot flourish. Full cognizance of the conditions which favor their growth is one of the keeping-up-to-date responsibilities of the administrator. Certainly here we must include reduced teaching loads, relative freedom from administrative chores, an adequate budget for equipment and supplies, as well as the creation of effective means of recognition and publication of these accomplishments.

While some money for research will come from our general funds, this is usually far from adequate for our programs. While the investigator must present the details for application for funds, it is the responsibility of the administrator to seek out funds from outside sources. Such grants or contracts must come from industry, foundations, or from governmental agencies.

While the ideas and initiative for research must come from the staff member, every encouragement should be given by the administrator. Here it is particularly important that the teacher-student ratio be kept low. Far too many schools, knowingly or not, have diluted the quality of graduate training through sheer force of number of trainees. It is here that we may weaken the value of the M.S. or the Ph.D. training to the point where it will compare unfavorably with other graduate programs. Rather a strong master's than a weak Ph.D. program. Neither should suffer by overloaded professor-student ratios. We at Connecticut have agreed upon a maximum of five graduate trainees for each professor who has received the approval of the graduate school. The only way we can increase the size of our program is through the addition of further qualified men to our staff. Programs of quality suffer not only from high teacher-student ratios, but suffer from inadequate organization in promoting the research as well as from the lack of the proper spirit at the administrative end of the organization.

Effective recruitment should be launched in the undergraduate group in presenting to the better student the vast challenges and intellectual satisfaction that lie in advanced work.

If we do counselling well, starting at the latest with those in their last two years of professional training, we can eliminate some of the factors which increase the time involved in earning advanced degrees. We are well aware of the fact that upwards of four or more years beyond the baccalaureate degree is the usual actual time consumed, not the often published three years for the Ph.D. degree.

Such unnecessary prolongation of this training, especially with the new five year course, should be of concern to us. We can help by increasing the quality of students and by better planning their undergraduate preparation. If a language is required or added mathematics or some other "tools," we should see if they can be scheduled before their graduate days. We should see that added remuneration comes to them as assistants so that they do not have to use their energies in outside work to make a living possible. You and I know many of these factors which stretch out the time involved in earning graduate degrees.

It is important that those involved in graduate training study the "climate" under which our future teachers and industrial researchers are trained. Are we safe in assuming that our programs as now constituted have the flexibility to prepare candidates for teaching and for the rigors of research? The weight of tradition of classic demands for credits rather than the value of independent study must be modified if it exists in our institutions. It is my honest opinion that the average Ph.D. program is not adequate preparation for teacher training. Narrow specialization is not adequate for teacher training, and it is doubtful whether it meets the demands for many of the governmental and industrial positions. We must join, administrator and staff, in reexamining our programs in light of the demands of those who employ our trainees. Are we developing broadly educated personnel capable of exercising initiative, imagination, and wisdom in dealing with complex problems? If not, we should look less to credit requirements and more to the type of program which recognizes not only the professional development but also that of the individual who must be a member of a professional family who can join in the activities of the organization.

In conclusion, may I remind you that the administrator would be derelict in his duty if he did not demand from his staff loyalty to the school, a reasonable productivity, and a lively cooperation with his fellow staff members and the administrator in developing the professional programs.

I should like to leave you with a final plea—be kind to administrators; they have their problems too.

FUNCTION OF THE LIBRARY AND LIBRARIAN

RALPH E. ELLSWORTH

Perhaps I can be most helpful by sharing with you the worrying I am doing on several critical problems relating to the topic of our discussion. First, colleges of pharmacy libraries are now presenting universities with a serious problem arising from the fact that while professors of pharmacy publish the results of their research in a relatively small number of professional pharmaceutical journals, they use, in doing their research work, the basic journal files in the fields of chemistry, biology, and medicine (both human and animal). In 1940 I made a study of this problem and published it in the *American Journal of Pharmaceutical Education*. This study proved the statement I have just made. If the study were repeated today, I predict that the same basic relations would exist.

As long as colleges of pharmacy were located in the same buildings as were chemistry and biology, there was no problem because researchers could use a library that was common to all of these areas, but now that there is a tendency for colleges of pharmacy to want their own buildings, frequently located at considerable distances from chemistry and biology, we are faced with a problem of providing access for pharmacists to the basic scientific journals. The cost of buying duplicate files of these journals will be in the neighborhood of \$50,000 to \$100,000 even if the files are available. If this money is lacking, then what will we do to provide you researchers with the basic materials that you need? The problem of providing access to the current materials is not a major one.

Second, most of you are aware I think that since World War II research in all fields in our own as well as in all countries of the world has expanded radically. Research results in publication. We directors of libraries are having a difficult time convincing our administrators that because of this tremendous increase in quantity of publication, libraries are going to have to cost more than they have in the past if we are to keep you researchers supplied with the new materials. You can help in this respect if you, too, will help administrators understand the nature of this problem.

Third, there are several things you have a right to expect us librarians to do in helping you keep up with this new massive literature: (1) you should expect us to be able to bring to your attention in a manner that is convenient for you the new research that appears in publications that would normally be outside your professional reading. Articles that appear in journals from other fields should be purchased and placed on your desks. To do this work we librarians must know each one of you intimately enough so that we know what your interests and problems are. We librarians ought to attend your faculty meetings so that we would have a better understanding of your working habits and your areas of interest. (2) Many of you know that we are now in the midst of a revolution in communication. New methods of publication are springing up and we librarians should do our best to keep you acquainted with the new technology, and we should make full use of this technology by bringing to your attention the publications you will need

to consult. You are all acquainted with microfilm, of course, but have you seen the microcards and microsheets and are you aware that there are now cards into which strips of microfilm can be placed? Have you seen the new xerox copyflow machines? These are machines into one end of which one feeds microfilm and out of the other end of which comes, like a paper towel, enlarged photoprints from microfilm? This is an inexpensive method of providing you with readable photocopies of material that is difficult to obtain otherwise. (3) the new technology could revolutionize some of our publishing methods if we would only take advantage of it. For example, the journal, as we know it, could be supplemented by separate publication of articles in microfilm. These articles could then be given to you either as a microfilm strip inserted in cards or as microcards. You could keep these conveniently in your office desks for consultation on your immediate problems.

Then there is the whole problem of machine bibliography. We are now reaching the end of an era of handicraft bibliography and we are entering into a new era in which electronic machinery is being used for rapid control of the literature of scholarship. Your librarian is supposed to be keeping track of these new developments and he should keep you posted on their application to your problems.

Fourth, we librarians could be helpful to you on your personal reading. Because of the nature of the curricula in pharmaceutical education most pharmacists have not had the opportunity of a rigorous education in the social sciences. And yet some of the most serious problems you face in your professional life are of a social science nature. I refer, of course, to the whole problem of the public interest in medical care. It is my impression that most of the general informational sources you use tend to reflect a one-sided analysis of these problems. Magazines like *Time*, *Life*, *Reader's Digest*, *The Saturday Evening Post*, *News Week*, etc. should be supplemented by magazines like the *Reporter*, *Harper's*, and the *Atlantic* so that you can expose yourselves to the other side of these questions.

I would suggest that you try to practice the habit of reading by opposites. I mean by this that it is perfectly natural for all of us to read the things that reinforce our preferences and opinions. I am saying that it would be wise to make a deliberate effort to read also publications that reflect the opposite view. In many parts of the world man is finding new methods of solving the problem of social control of public health. Each of us, it seems to me, has an obligation to have a full and accurate understanding of all kinds of thinking on these problems.

Fifth, I should like to close by pointing out something that may be obvious to some of you, namely, that we are entering into a time when our undergraduates are beginning to take a different attitude and are not likely to be so passively receptive to our programs as they have been in the past. We have been reading in the papers lately of student riots and other evidences of rebellion on the part of undergraduates. What this means is that students are fully aware of the fact that our generation has worked itself very close to a state of complete chaos in terms of the social structure. The youngsters are aware that we don't know what we are doing, and they are restless with

the professional training curricula we have been offering them. They are flocking to the honors programs and to courses where there is some chance that they can find out new ways of solving problems that are of a survival interest to the students. The professional schools are not going to be able to escape the impact of this revolution in students' attitudes. I think you will have to create more flexibility in your programs so that the students will have time to explore these questions. If you do not do this, they will abandon you and will turn to curricula in which they can find satisfaction for their curiosity.

KEEPING UP IN PHARMACY ADMINISTRATION

FRANCIS C. HAMMERNESS

Keeping abreast of the changes in pharmacy has become more important in the area of pharmacy administration than in any of the other disciplines in pharmacy. Fifteen years ago the pharmaceutical industry, retail pharmacies, and the distribution of drug products was not a great deal different than it had been for decades in the United States. Immediately following World War II the complexion changed with the introduction of the antibiotics and later the steroids, tranquilizers, etc. These advances not only brought about better health, but a phenomenal growth to the drug industry which has led to the creation of many new problems in drug distribution and keen competition. To compete it will be necessary for the industry to spend 8 to 10 per cent of their sales on research and development. In many instances they will have to push proprietaries that can be sold over the counter for a measure of stability. In short, this puts a great deal of emphasis on their marketing departments which must find new channels and methods of distribution. At the same time new trends in merchandising have developed which include the distribution of drugs as well as groceries and appliances. Direct examples are the discount houses and mail order prescription outlets, the latter coming to the attention of the public within the last twelve months because of the attention given to them by the Kefauver investigations in part and the population growth in the United States of the senior citizen.

It can be readily seen that the day-to-day changes in all areas of pharmacy are so rapid that they cannot be ignored temporarily and left until the end of the semester, at which time the instructor would revise the lecture material for presentation the next time the course is offered, which might be next year. It is imperative that teachers of pharmacy administration keep up to date in their area on a day to day basis.

Another factor that increases the importance of keeping up to date is that most of the problems facing pharmacy today are in the area of pharmacy administration. Some have suggested that seven of the ten problems facing pharmacy are in the area of drug distribution. The problem of prepaid prescription plans and state welfare prescriptions are a case in point along with the discount drug outlets, mail order prescriptions, super market pharmacies, rack jobbers, and other outlets through which drugs have not normally been distributed in the past.

To remain current in the area of pharmacy administration is difficult not only because of the rapid day-to-day changes, but for the reason that it encompasses many areas which are full time specialties in themselves. Management, marketing, economics, accounting, law, and finance are included in this area. This becomes more burdensome as one enters the graduate program. It might be well to keep in mind that one-man departments are not able to keep up as well as they should much less part-time teachers in this area.

There is no one book or journal that a teacher can turn to for the necessary information in pharmacy administration. Current information is obtainable from the accepted journals in the profession such as *Drug Topics*; *Journal of the American Pharmaceutical Association, Practical Edition*; *American Drug-*

gist; and *Drug Trade News*; as well as in the *American Marketing Journal*; and the *Journal of Retailing*. Other publications such as the *Lilly Digest*, *The Pink Sheet*, *The Census of Business—Retail Trade*, and many others are sources of up-to-date information for the pharmacy administration teacher. Today there are many books being written on the various phases of the business world which are informative and extremely current. *The Affluent Society*, *Status Seekers*, *The Organization Man* and *Madison Avenue, U.S.A.*, are examples of books in this class.

It is well known that research is an excellent way of keeping current in any field of endeavor. It might be well to include in this area extension work originating from the school of pharmacy as research and extension programs are often closely associated.

There is no question but what activity in current pharmaceutical affairs on the state and local level will of necessity keep one informed as to the changing pattern in pharmacy. Education, because of its progressive nature, should take an active part in forming the destiny of pharmacy at all levels. Changing legislation in state pharmacy laws affords the teacher of pharmacy administration an excellent opportunity to participate in present day problems.

For one reason or another the participation in regional and national meetings and seminars which offer programs designed to aid the teacher leaves something to be desired. Schools of pharmacy have a tendency to criticize the retail pharmacists for their apathy in attending refresher courses and seminars. The teacher is not immune from the disease of obsolescence. Conferences and seminars offered by the school of business on the college campus make it possible to keep up in the areas of business administration.

Often overlooked as a source of information and ideas is the successful operator of retail pharmacies. Many times they can aid the teacher in pharmacy administration in providing an up-to-date laboratory for acquiring new ideas and the institution of others. This also lends to a better relationship between the school and the practitioner.

One should take advantage of the opportunity to audit new or revised courses in the school of business as a form of continuing education. It goes without saying that a first name relationship with the business school faculty can be of great assistance in keeping tabs on new developments.

There is no question but what membership in a service club such as the Kiwanis, Rotary, and Senior Chamber of Commerce would be beneficial to one interested in local and national problems in the social sciences.

Last but not least is the personal interchange of ideas between the teachers themselves while participating in formal conferences and seminars. It is often said that the formal presentations are stimuli to excellent discussions in the corridors following the formal session. A better understanding of mutual problems results from the personal contact of teachers with one another.

Keeping up to date in one's specialty is not an easy task and should not be taken lightly, but on the other hand there are many opportunities afforded the conscientious teacher if he will only avail himself of them. They will help to make his task of keeping current a little easier and somewhat formalized.

THE NECESSITY OF KEEPING UP TO DATE IN PHARMACOGNOSY

VARRO E. TYLER, JR.

In speaking to this group on the necessity of keeping up to date with current literature and techniques in pharmacognosy, I do not feel that I am "carrying coals to Newcastle"; rather, I feel that I am "carrying Newcastle to Newcastle." Actually, I am in the same position as the minister who feels that he should preach to his congregation about the merits of church attendance but hesitates to do so because the ones to whom he wishes to address himself are never in the audience.

The purpose of this seminar is to keep you up to date in your chosen field. You are here for this purpose. There is no need to impress you with the importance or necessity of reading the current literature, listening to seminars and addresses, or attending conferences, all of which have this as their designated purpose.

So, in their absence, let us talk a little about our beloved colleagues who are not in attendance at this seminar. May their ears burn and their noses itch! Certainly some of them are unable to be here for reasons which are perfectly valid. Broken legs and ill grandmothers are afflictions which most of us must bear from time to time, and it is not my purpose to make light of them. Colleagues absent for these and similar reasons are excused from what I am about to say. But the rest. Ah yes, the rest.

To appreciate fully the necessity of reading the current periodicals and most recent reference books, of attending scientific conferences and meetings, and of using all available means at one's disposal to keep up to date, let us examine briefly the consequences of failing to do so. A teacher who is unaware of recent developments in his specialty field does not teach. It is impossible for him to teach. He only thinks that he is teaching, and in thinking so probably fools only himself, since students with active minds are apt to be quite perceptive. A researcher who is unaware of the latest developments in his area cannot perform research. He merely repeats the mistakes of the past. In short, a professor who is not aware of current developments in that subject matter which he professes to teach is not a professor at all. He is unworthy of the title.

Unfortunately, however, all of us realize that persons of this type do exist, and the discipline of pharmacognosy is afflicted with more than its fair share of these living, breathing, but unthinking, vegetables. Yet the tendency is for us to say, "Why worry about it? If Professor X or Professor Y chooses to relax a bit in the shelter of his ivory tower and does not keep pace with recent developments in the field, why worry? It's his hard luck, not mine."

If this were only true, I would not have accepted this assignment to say a few discussion-provoking words this afternoon. But the fact of the matter is that Professor X's and Professor Y's indifference to their chosen field and the lack of productivity which results from their indifference is both their

hard luck and our own. Although you may not have fully realized it in the past, you are judged as a pharmacognosist not only by your own performance but by that of all the other professionals and semiprofessionals in the field. Any scientific discipline is judged by outsiders not on the basis of the work of a single individual but on the basis of the sum total of the work produced by all of the professionals in the field. Since Professor X and Professor Y are pharmacognosists, albeit poor ones, and you are a pharmacognosist, it is impossible for you to divorce yourself completely from association with them. Consequently, your performance in teaching and research will be judged not merely on the basis of its own merits but on a broader scale as a small contribution to the greater whole which is pharmacognosy.

Why keep up to date? Why read the literature? Why attend scientific conferences? Why carry out an active, progressive teaching and research program? For your own benefit, certainly, because without these activities you are nothing. But there is a more important reason and one of which you should be ever-mindful. You should do these things because you owe it to your colleagues in pharmacognosy. Although you are only a tiny piece in the vast mosaic which comprises a scientific discipline and may think at first glance that your activities and contributions may never be missed, keep in mind that mosaics are viewed and judged on the basis of the complete composition.

Whether you like it or not, yours is a part of a team effort, a team with which you are inseparably associated. You owe it not only to yourself but to your colleagues to expend every effort toward reaching that goal for which your education and your life's work have prepared you, specifically, the advancement of pharmacognosy through active teaching and research. You can begin only by keeping up to date!

HOW I KEEP UP TO DATE IN MY SPECIALTY— PHARMACOGNOSY

VARRO E. TYLER, JR.

If I were to adhere strictly to the official title of this paper, it would be a very short one. A complete and truthful report would consist of two words only, "I don't." In the interest of being somewhat more informative, I have taken the liberty of modifying the title slightly, and propose to tell you how I try to keep up to date in my specialty, pharmacognosy.

In addition to the slight change in title, I must beg your indulgence for the excessive use of the first person singular pronoun which is distributed so freely throughout the talk. Again, this excess has been forced on me by the assigned title which requires a discussion of my personal methods for accomplishing this feat. In the knowledge that there are some really worthwhile tricks to the trade, which I am unable to employ for one reason or another, I will try to mention them whenever possible.

Before attempting to answer our problem of keeping up to date in pharmacognosy, let us briefly examine the problem itself to determine the magnitude of the task involved. Why should it be such a problem to keep abreast of advances in the field? How big a job is it? Perhaps you feel that the problem has been exaggerated, and you have little difficulty in following the latest developments in pharmacognosy.

In order to permit each of you to determine for himself just how well you are meeting your obligations to your classes, to your profession, and to yourself, I have prepared a short list of topics. They have been selected at random from the recent literature, but each contains knowledge which is important to pharmacognosy. As I read the titles, keep a silent score and see how many of them have contributed to your fund of knowledge.

1. Evidence has recently been obtained which appears to settle a long-standing dispute about the formation of hyoscyamine and hyoscyne from a common precursor. Have you read the details of this informative work by E. Leete in the *Journal of the American Chemical Society*, 82, 612 (1960)?

2. The use of an extract of the seed of *Iberis amara* in the conclusive typing of the M factor of human blood is briefed in *New Medical Materia*, 2 (1), 9 (1960). Are you familiar with this interesting and significant development in pharmacognosy.

3. K. J. Schmersahl's paper entitled (in German) "A Contribution to the Documentation and Evaluation of Pharmacognostical Literature" appeared in *Die Pharmazeutische Industrie*, 21, 493, (1959). Did you miss it?

4. Important contributions to our knowledge of the biosynthesis of plant glycosides have been made by Yamaha and Cardini in the *Archives of Biochemistry and Biophysics*, 86, 127, 133 (1960). Have you mastered the details of these works?

5. The chemotaxonomic importance of anthraquinones has been discussed by Hegnauer in *Planta Medica*, 7, 344 (1959). Are you aware of the systematic significance of these compounds?

If you find that you are unfamiliar with the work reported in any of these publications, you must agree that keeping up in pharmacognosy is a problem. Even if you have read all of them, do not rejoice too much, for these examples

have been selected from the readily accessible literature rather than from some of the more obscure publications.

In analyzing the problem which confronts us, I believe it is important to keep in mind the definition of pharmacognosy. Although no two teachers agree on the exact description and limits of our area, all will recognize it as an applied science, combining the broad basic fields of biology and chemistry with another applied science, pharmacy. It is this extreme breadth of our field which renders it difficult to keep informed of new developments.

Consider the amount of literature appearing in biochemistry, which is just one of the many fields pertinent to pharmacognosy. Asimov (1) has estimated the number of papers of biochemical interest which appear monthly as 2,500. *Current Contents*, a weekly periodical reprinting the tables of contents of some 500 journals of importance in the chemical, pharmaco-medical, and life sciences, averages about 100 pages per issue. *Chemical Abstracts* is now publishing more than 20,000 columns annually, but covers only a portion of the literature of interest to pharmacognosists. *Biological Abstracts* now runs about 50,000 entries per year, but likewise omits much of interest.

This area of material not covered in *Chemical Abstracts* and *Biological Abstracts* is an interesting and important one; furthermore, it presents a very difficult problem for the conscientious student of the literature. Fortunately, some of the foreign periodicals help to fill the gap with abstracts of significant papers. One of the most helpful of these is the *Pharmazeutische Zentralhalle*, which not only publishes abstracts in every issue but also frequently a section devoted to literature review. This lists the titles of papers appearing in a considerable number of pharmaceutical periodicals, some of which are rather obscure, and the titles are translated into German regardless of the language of original publication. I find it particularly useful for those journals originating in Czechoslovakia, Poland, Bulgaria, and similar countries whose languages I cannot read and whose pharmacognostical studies might not otherwise come to my attention. The *Journal de Pharmacie de Belgique*, *Scientia Pharmaceutica*, and *Pharmaceutica Acta Helvetiae* are just a few of the periodicals which regularly feature abstracts of important works which appeared in other journals.

Another problem which confronts the pharmacognosist in his attempt to follow recent advances in the science is the lack of review articles written on this topic in the English language. Although some contemporary foreign journals do publish scholarly reviews of pharmacognostical subjects, there is no American outlet for such compilations, and the number appearing in the *British Journal of Pharmacy and Pharmacology* is very small. Also, there are no annual reviews of pharmacognosy of the type dedicated to the summary of biochemical and plant physiological knowledge. It is to be hoped that publications of the American Society of Pharmacognosy which are now in the planning stage will remedy this deficiency in the reasonably near future. At present, the avid follower of pharmacognostical literature must be an expert at tracking his quarry, and he still plays a lone hand, at least in comparison to his colleagues in the basic science fields.

By this brief summary I hope to have persuaded those not already convinced that keeping abreast of current developments in pharmacognosy is a difficult, even impossible, task. Now I propose to tell you how I approach the problem, not how I conquer it, but how I approach it in such a way as to prevent it from completely conquering me.

The accomplishment of most tasks requires suitable tools and a knowledge of their use. Applying this maxim to keeping up in a scientific field means that one must have access to the literature, especially the periodical literature, and one must have the ability and the time to use this literature properly. In pharmacognosy this implies a good reading knowledge of the German language, for much of the scientific work in our field still emanates from that country. There has been a great deal of talk recently about a core curriculum for graduate students in pharmacy, and two or three life-times' worth of courses have been recommended by one expert or another, usually with the idea of sharpening the expert's personal ax. Practically all such recommendations fail to emphasize adequate foreign language training, especially in German, for pharmacognosists. Here is an area in which we can do a great favor for our graduate students and future teachers of the science by insisting that they learn and practice their skills in this language. I believe that a pharmacognosist without a good reading knowledge of German is unable to keep abreast of two-thirds of the literature in his chosen field, even if his library facilities are the best available. Other languages, especially Russian and French, would prove useful but are, at the moment, of secondary importance.

To keep up you must also have the tools, the books and journals which form the essential reference works of the science. Furthermore, they should be readily available. Current periodicals should not be immersed in some dusty stackroom many blocks from the professor's office. At the University of Washington the branch library system prevails. This system has aspects which are both good and bad, and a detailed discussion of them is beyond the scope of this presentation. One feature in its favor is that it does permit our pharmacy librarian to circulate pertinent journals to our faculty as they appear. This, too, may have its disadvantages, but at our institution it works very well. It permits me to examine the recent acquisitions in the relative peace and quiet of my own office. They come to me; I don't search for them. I am essentially lazy by nature, and I like the service. The faculty is quite conscientious about circulating them promptly. One rarely keeps any journal longer than a day, and I have heard very few complaints about missing numbers.

I know some institutions where librarians circulate the titles of journals received and even reproductions of tables of contents, instead of circulating the journals themselves. Although better than nothing, these must be considered as substitutes for the real thing. Other libraries have sections devoted to the journals of the week. Our medical library at the University of Washington has such an area in the periodical room, and I used to make considerable use of it, devoting one afternoon a week to the project of looking over the new arrivals. But that was B.C.C., before *Current Contents*.

Most of you are familiar with this publication, so it needs no further description here, other than to say that it has been the biggest aid to my keeping up with the literature since I learned to read. As it crosses my desk each week, I make an effort to scan it from cover to cover, noting the papers of interest to me. If I see one which is of immediate interest, for example, one relating to the biosynthesis of the ergot alkaloids, I note the reference, and as soon as it is convenient, I go to the library where the particular publication will be found, in order to read the paper. This is not always as easy as it sounds, since *Current Contents* gets advance title pages from many of the foreign publications, and we may receive the *Current Contents* listing it long be-

fore the periodical itself reaches our institution. Although not generally the case with domestic journals, this presents a problem with the foreign ones because one may have to make several trips in search of a particular reference. In the meantime, the citation may become mislaid or lost. Ideally, I suppose, the notations should be filed and indexed, but I keep mine in a pile, thumbing through them occasionally to see if one I have not yet seen is due in at the library.

After reading the paper, if it should prove to be of real interest to me, I write for a reprint. I use form postal cards for domestic requests but individually typed form letters for foreign reprint requests. These latter cost only a few cents more to mail, and in my experience the response to letter requests sent abroad has been much better than to postal cards. I try to keep a list of all requests and check the reprints off as they are received. In this way one can see at a glance if some particularly significant reprint has not been received within a reasonable period of time. Until recently I had not sent thank you cards for reprints received, but a colleague convinced me that this was the proper thing to do. We recently had some trilingual forms printed in English, French, and German, although the languages could be varied to conform to one's specific needs. The cards are quite impressive. Having received a number of these from foreign scientists in response to our own sendings, it is pleasant to be able to reciprocate the courtesy.

Another hint about using *Current Contents* to best advantage—keep a file of names and addresses of those publishing studies of immediate interest to you. When another such paper appears, you can send for a reprint immediately without having to check the original article for this information. I do this, but I try not to wear out my welcome by sending for reprints of doubtful interest to me until I have checked their contents in the original.

It is impossible to obtain reprints of some publications. Personally, I have yet to receive my first from a South American investigator, and I tried for many years before giving up. I did receive a letter once from a pharmacognosist in that area, but he was transplanted from Europe and probably had not become acquainted with the local practice of disregarding all mail from the *Estados Unidos*. In all fairness, many institutions there and perhaps even in our own country are financially hard-pressed and unable to furnish funds for the purchase of reprints and for postage. This creates a problem for the person who is trying to keep up to date.

I have been able to solve it by using a photocopying apparatus. Our department purchased one manufactured by the American Photocopy Equipment Co., and it has proved very satisfactory. There are numerous other manufacturers of this equipment, all of whom no doubt produce equally satisfactory products. It is not my intention to slight them or to give free advertising to any one manufacturer, but I can speak from experience about the Apêco apparatus. My only recommendation about the purchase of such a device is to make certain that it can be used for books and bound volumes as well as for single copies of journals.

We make considerable use of the apparatus in copying all sorts of literature materials which are needed for permanent reference and which might not otherwise be obtainable. Papers of which reprints cannot be obtained and sections of books and journals received on interlibrary loan which can be held for only a limited time can be copied with facility and filed for reference.

There is a lot more to filing for future reference than is apparent at first glance. I have always found it much easier to lose material in a file than to put it where it can be instantly recovered on demand. No one system is completely satisfactory, so I use several, according to my specific interests and requirements.

First of all, I maintain a general reprint file. This was originally set up using botanical origins as the major subdivisions. In seven years a number of chemical constituent divisions have been added, as have certain general headings concerned primarily with methodology and a very few with subject matter. For example, under the *c's* will be found a thick folder titled *Ceanothus americanus*, a plant whose alkaloids of unknown structure interested me at one time before I found out they were of interest to a dozen others who had something of a head start in examining them. A few years ago I began a study of the relationship of chemical constituents to plant classification, and this material now bulges under *chemotaxonomy*. Next is a folder labeled *chlorophyll*, a compound which created quite a stir in pharmaceutical circles a few years ago, and about which I have collected considerable information. Further along is *chromatography*, a repository for papers devoted to general methodology. Applied works are filed under the specific heading which is most appropriate. So much for the general file.

In addition to it I maintain three specialized literature files. One is devoted to the psychotropic plants, titled by common names. This type of heading is particularly useful to me in this case because one name may apply to several distinct plants which are similarly employed. *Sinicuichi*, for example, has been used for three different ones, and when I pull the folder with this title I get all the information I have on all of them, which is what I want.

The second specialized file is devoted to studies on alkaloid biosynthesis which are grouped according to the chemical classification of the alkaloidal nucleus: *indole derivatives*, *pyridine derivatives*, *tropane derivatives*, etc. To be sure, there may be a tendency to overlap here with some of the divisions in my general file, but I try to reserve this one for true biosynthetic studies. The general file gets the papers devoted to other phases of investigation.

My third specialized file is my pride and joy. It gives the widest possible coverage to the drug ergot and, as a result of some eleven years of work in this field, has become highly specialized. The papers are filed in it alphabetically according to the key word in their titles, and all of them are cross-indexed in a card file according to the authors' names. I was fortunate in having an experienced secretary set this one up for me and now have an experienced secretary to maintain it for me. In other fields I may misplace a reference occasionally, but when it comes to ergot I have the materials at my fingertips in a hurry. It would be nice to keep all of one's files in this manner, but I find it a little too time-consuming for general use.

The efforts which I have thus far described in obtaining pertinent literature usually bear fruit in great abundance, and one can, and I do, obtain by these methods far more literature than I can conveniently read in any given day. Those who know me will tell you that my desk is usually piled high with papers, journals, and even books waiting to receive attention, and they do receive it. While I do not subscribe to the philosophy expounded by William H. Whyte, Jr., in his best seller, *The Organization Man*, that it is not permissible to read the "trade journals" on "company time," I generally do not have time to do so

except for those on the circulating list which I must pass on to my colleagues as soon as possible. Consequently, the reprints I receive and those papers which have been noted for further study, and especially those written in a foreign language which require more time for translation and assimilation, accompany me home in the evening. When I can no longer stand to see the cowboys expend their ammunition in exhibitions of inferior marksmanship, or when the champion gets knocked out in the first round, I turn off the television set, turn on the reading lamp, and begin really to enjoy myself. Not that it happens every night, but it happens frequently enough to permit a complete clearing of that piled-up desk about once a quarter.

In my mind this is the real secret, if it can be called such, to attempting to keep up to date in any science. The working hours of the typical day are too full of lectures, conferences, committee meetings, students, laboratory work, and the like to permit adequate time to deal with the deluge of knowledge which confronts us. It is the rare teacher of pharmacognosy who teaches only one quarter in every three or four, as do so many of his counterparts in medical schools. In fact, I know of none in this situation, although some are much more fortunate than others.

There are all sorts of methods, systems, devices, and even schemes whereby one can obtain the literature pertinent to modern pharmacognosy, but the teacher does not keep up with progress merely by watching it. He must read, digest, and absorb it, and the key ingredient here is time, not leisure time, but time free from other responsibilities in which this unhurryable process can be carried out.

Personally, I have always felt that the demands made on my time in terms of actual teaching load were reasonable, and I am in a much better position in this respect than some of my friends. But I have just told you that much of my serious studying is done at home at night. As I see it, we, collectively as teachers and researchers in pharmacognosy, have become involved in a vicious cycle. We are unable to master the recent developments in our field because we have too little available time, and we have difficulty in justifying any reduction in course loads and other duties to our administrators because our productivity has been lowered by this very failure to assimilate recent advances.

As is the case with all cycles, no matter how vicious, this can be reversed. Increased attention to the current literature of pharmacognosy and diligent application of the facts contained therein will increase productivity, will make each of us a better teacher and researcher. This improvement is bound to gain for us, individually and collectively, increased recognition and a lessening of course loads and other routine responsibilities. In turn, this will permit greater improvement of ourselves and of our profession.

In my opinion, this increased knowledge and productivity is the only road by which pharmacognosy can move forward. The first step along this course is "keeping up to date."

REFERENCE

- (1) Asimov, I., "Only a Trillion," Abelard-Schuman, New York, N.Y., 1957, p. 151.

HOW I KEEP UP IN MY SPECIALTY—PHARMACOLOGY

JOSEPH P. BUCKLEY

I believe that a more correct title for this presentation would be "How I Try to Keep Up With My Specialty." Pharmacology has advanced so rapidly in the past fifteen years that it is probably more difficult to keep up to date in this field than in any of the five broad areas of pharmacy. There is really no easy way to keep abreast of the field, and I am sure that I am not alone in admitting that I have neither the time nor the desire to read and digest every paper and article published in the area of pharmacology. The fact that we usually include basic pharmacological principles, general pharmacology, pharmacodynamics and therapeutics of drugs in our courses in pharmacology, further broadens the area and increases the number of journals that must be scanned regularly in order to keep up to date with the changes in the field. Those of us who are engaged in research projects and graduate programs must know what other investigators are doing in our particular areas of interest, and we must have some way of keeping informed regarding the work of our colleagues all over the world. This afternoon I am going to discuss some of the methods that we use to keep up with the advances in pharmacology and therapeutics.

LITERATURE

Literature Research Conferences. Once or twice a month we hold a literature research conference, which usually lasts one to two hours. A graduate student is assigned a particular area, i.e., cardiovascular pharmacology, psychopharmacology, hypertension, anti-diabetic agents, etc., and he makes a complete survey of the literature published in the previous three to four months. He prepares abstracts of each paper and the abstracts are mimeographed and a copy presented to each member of the conference. He briefly discusses each paper; however, the length and detail of the discussion of a particular publication will vary depending upon the significance of the paper as to importance and/or interest. This is not a seminar, and since the main purpose is to cover all of the publications in the area, the reports must of necessity be brief and to the point. A question and answer session follows the discussion of the papers, and anyone desiring additional information can of course refer to the original publication. We have encouraged the students to utilize *Current Contents* in preparing for these conferences. We have found the literature research conference to be an excellent method for keeping up in specialized areas and have discovered some relatively important papers which had previously been overlooked.

Scientific Journals. We are extremely fortunate at the University of Pittsburgh Medical Center in that we have an excellent library that is well organized and supervised. The latest periodicals are in a designated reading area and kept there for approximately seven days. I attempt to glance through certain of the journals at least once a week and abstract those papers which are of interest to me both from the academic and research viewpoint. I also make it a point to send for a reprint of those papers which I feel belong in my reprint file as I believe that the maintenance of a well organized, up to date reprint file is an important adjunct to keeping abreast of the field. The

reprint file provides a quick source of first hand, original information and data on pharmacology and therapeutics. The journals can be classified into three groups: general, review and special (see Tables I-III).

Since it is almost impossible for many of us to scan through all of the current publications regularly because of heavy teaching and/or research loads as well as administrative duties, it would appear that review papers might be one of the best methods of keeping up with the advances in our field. The main disadvantage of review articles and abstracts is that they are usually several months to several years behind the current literature. Be that as it may, the review articles and journals play an important role in keeping us abreast of the various facets of pharmacology, especially those fields with which we might not be too well acquainted.

I believe that the *Annals of the New York Academy of Sciences* is an exceptionally useful publication as the monographs pertaining to pharmacological and medical research cover all phases of the field under discussion. This usually includes the chemistry of the compounds, the physiology and pathology of the particular system or organs concerned, methodology, general pharmacology, pharmacodynamics, biochemistry, clinical pharmacology, and clinical evaluation. Because of this method of approach, it is often possible to correlate chemical structure with biological activity, biochemical activity with pharmacological action, and animal pharmacology with clinical effectiveness and evaluation.

Another method of keeping up with the literature is through the use of a service which prepares lists of titles and authors of papers appearing in the current issues of the journals. One such service is *Current Contents*, published by the Institute for Scientific Information, Philadelphia, Pa. Although at first glance it appears to be relatively expensive, it is in reality an inexpensive investment considering that it covers practically every journal in our area. Many of the authors' addresses are listed and original tear sheets are available. We have been using the above service and have found it to be an extremely valuable publication.

SCIENTIFIC CONFERENCES

Another major method of keeping up with the field is by attending professional meetings, conferences, symposia, and seminars. We are limited as to the number of meetings that we can attend in any given period by our work load and finances. Therefore it is important that one carefully selects the meeting or meetings which would benefit him the most. I would classify the following three as major meetings: (1) Federation of American Societies for Experimental Biology, (2) American Pharmaceutical Association and (3) The American Society for Pharmacology and Experimental Therapeutics.

The Federation meetings are held in the spring. The main advantage of this meeting is that six societies meet simultaneously (American Physiological Society, American Society of Biological Chemists, American Society for Pharmacology and Experimental Therapeutics, American Society for Experimental Pathology, American Institute of Nutrition, and American Association of Immunologists), and we have the opportunity to hear papers in the various sections of each of the societies. The main disadvantage of the Federation meetings is that they are getting so large that we cannot attend all of the sessions that we

might want to because of the large number of papers being presented simultaneously.

The Scientific Section of the American Pharmaceutical Association meets at the annual convention of the Association held either in the summer or spring. Since most of us are teaching in schools of pharmacy we are also concerned with other facets of the pharmaceutical profession, and I believe that we should attempt to attend each annual meeting. The A.Ph.A. meetings have become more important because there has been a steady increase in the amount of pharmacological research conducted in schools of pharmacy and there has also been an improvement in the quality of research over the past few years.

The Pharmacology Society meeting is held in the latter part of August or the first week of September and is relatively inexpensive as it is usually held on a university campus. The meeting also includes a special teaching institute in one or more areas of pharmacology, as well as workshop sessions for advanced students and recent doctorates.

We encourage all of our staff members and advanced graduate students to attend the American Pharmaceutical Association Convention and either the Federation meetings in the spring or the Pharmacology meetings in the fall.

The Teachers' Seminar on Pharmacology has become an important adjunct in keeping abreast of the field since many of the participants discuss recent advances in various areas of pharmacology as well as teaching methods, facilities, testing methods, etc. Recent advances in cardiovascular pharmacology and psychopharmacology were discussed by most qualified investigators at the 1957 seminar held at the University of Washington. I hope that the next teachers' seminar in pharmacology will devote at least one day to a scientific program in which two or three areas of pharmacology can be critically reviewed by the most qualified individuals available.

The New York Academy of Sciences sponsors conferences in practically all areas of pharmacology and therapeutics. Although the papers are eventually published in the *Annals*, it may take as long as a year after the conference for the publication to appear. In addition only the formal discussion of the papers will appear in the *Annals*; whereas the informal discussions from the floor are usually omitted.

SUMMARY

The following methods can be utilized to keep up with the rapid advances in pharmacology and therapeutics.

1. Monthly literature research conferences.
2. Regular scanning of current publications and the maintaining of an active, well catalogued, reprint file.
3. Proper utilization of review journals, review articles, abstract journals, and symposia publications.
4. Utilization of a service supplying titles and authors of current publications.
5. Attendance (and participation) of professional meetings, conferences, and seminars.

TABLE I. GENERAL—JOURNALS CONTAINING CURRENT DATA IN PHARMACOLOGY AND THERAPEUTICS

- **Acta Pharmacologica et Toxicologica*
- **American Heart Journal*
- **Archives Internationales de Pharmacodynamie et Therapie*
- **American Journal of Physiology*
- Antibiotics and Chemotherapy*
- **British Journal of Pharmacology and Therapeutics*
- Bulletin of Experimental Biology and Medicine (USSR-trans.)*
- **Circulation*
- **Circulation Research*
- **Clinical Pharmacology and Therapeutics*
- Current Therapeutic Research*
- Journal of Applied Physiology*
- **Journal of the American Medical Association*
- **Journal of the American Pharmaceutical Association (Scientific Edition)*
- Journal of Clinical Investigation*
- Journal of Laboratory and Clinical Medicine*
- Journal of Medicinal and Pharmaceutical Chemistry*
- Journal of New Drugs*
- **Journal of Pharmacology and Experimental Therapeutics*
- **Journal of Pharmacy and Pharmacology*
- **Journal of Physiology*
- Lancet*
- Monographs on Therapy*
- **Pharmacological Reviews*
- Pharmacology and Toxicology (USSR-trans.)*
- Proceedings of the Council for High Blood Pressure Research*
- Proceedings of the Society for Experimental Biology and Medicine*
- **Psychopharmacologia*
- Quarterly Journal of Experimental Physiology*
- Toxicology and Applied Pharmacology*

TABLE II. REVIEW JOURNALS

- Annual Review of Biochemistry*
- Annual Review of Medicine*
- Annual Review of Pharmacology (to be published)*
- Annual Review of Physiology*
- Antibiotics Annual*
- Pharmacological Reviews*
- Physiological Reviews*
- Review of Allergy and Applied Immunology*

TABLE III. SPECIAL JOURNALS

- Abstracts of Soviet Medicine*
- Annals of the New York Academy of Sciences*
- Chemical Abstracts*
- Excerpta Medica, Sections II, VI, and XVIII*
- Federations Proceedings*

*Those Journals regularly viewed.

HOW I KEEP UP TO DATE IN PHARMACY

BEN F. COOPER

For a teacher in a school of pharmacy, there are three general areas of responsibility: professional, educational, and academic.

The professional area relates to the practice of pharmacy and includes responsibility for local, regional, and national professional organizations, extension services, internship training, and legal and ethical standards of pharmaceutical practice.

The educational area relates to the practice of teaching, and includes methodology and philosophy of education, counseling, recruitment and college administration.

The third area of responsibility is the academic area which relates to competence in one or more disciplines. It is this area that I would like to consider in detail by discussing ways and means of keeping up to date in the academic discipline of pharmacy.

How can we keep up to date? Before answering this question, we must answer another: with what do we propose to keep up to date? Is there a choice of subjects, or areas, or fields of specialization so that we shall attempt to keep current in some and not in others? Or, are all fields of scientific endeavor pertinent and valuable enough to require constant study and evaluation? If we choose pharmacy as our specialty and agree that we should keep up to date in it, do we know what is meant by pharmacy? What areas are included in the specialty of pharmacy? Does it include pharmaceutical chemistry, pharmacognosy, pharmacology, pharmaceutical administration? And also does it include biological chemistry, radiochemistry, mathematical statistics, and the host of other scientific disciplines that we are called upon to use almost daily in our work?

Just after graduation, I attempted to keep up with everything. It was as if I had jumped on a horse and rode off in all directions at the same time. After a few years of frustration, hair pulling, and alienation of my family, I decided to define my specialty and define the relationship of other areas to it in order to use my time to the best advantage. My definitions are not perfect, but they have brought a reasonable amount of order into previous chaos.

The choice of the word *pharmacy* to describe a specific academic discipline is unfortunate due to confusion with the same word which is used as a collective or general description of any and all phases of pharmaceutical education and practice. At Oregon State College we have adopted the term *pharmaceutical science* to describe the specialty and the department formerly referred to as pharmacy. While this new terminology may be criticized for its generality, it does avoid confusion with the non-specific term pharmacy.

In most schools of pharmacy, the undergraduate courses assigned to the department of pharmacy usually include some or all of the following under one title or another: history, literature, orientation, introduction, physical

principles, fundamentals, physical pharmacy, arithmetic, calculations, preparations, technology, compounding, dispensing and prescriptions. The graduate courses in pharmacy are similar: history, literature, manufacturing, formulations, incompatibilities, physical principles, rate processes, colloids, etc.

In answering the question, with what shall we keep up to date, I would collect the courses assigned to pharmacy into three categories: (1) history and literature, (2) physical principles, and (3) formulations. These I would designate the primary areas of my specialty. These are the areas to keep up to date in breadth and in depth.

In addition to these three primary areas, there are some closely related areas which I would designate as secondary areas, meaning that they should be reviewed and evaluated in breadth but not in depth, except as time and interest permit. These areas are: pharmaceutical chemistry, pharmacology, pharmacognosy and pharmaceutical administration.

Finally, one should have an outside interest, an area outside of but related to pharmacy with which to keep up to date, again in breadth but not in depth except as time and interest allow. For example, I have two outside interests: mathematical statistics and dentistry.

If these are the areas with which to keep up to date, how then do we keep up to date? What methods, systems or procedures can be employed? There are five methods which I would like to suggest.

First, independent reading and study is the most convenient and most useful method. It requires little physical movement and is adaptable to whatever time is available. Competent assistance is usually available on campus for any questions or problems which may arise. A decided advantage is flexibility, allowing study in many areas of immediate or long range interest. This method suffers however from lack of planning and scheduling. It is a method which is frequently neglected due to pressures of other duties and responsibilities. Personally, I seldom have time for it during normal working hours. Thus it must be accomplished during evenings, weekends, and vacations. For this reason alone, teaching becomes far more than an eight-hour day or forty-hour week. It is a way of life.

Second, research is an important method of keeping up-to-date. Even more important, it is the only method of going beyond the present. Research serves several functions in keeping us up to date. It stimulates reading and study, develops physical skills, gives a better understanding of the literature, promotes a professional and scientific atmosphere, and provides new and original information. It has the disadvantages of requiring time, money, equipment, and personnel which are usually in short supply. For most of us engaged in teaching, it is a continual struggle to reserve part of a week or a day for research. One day per week will permit only extremely slow progress on a research problem. But I think that even one day per week may be vital and necessary. Since the amount of time which can be devoted to research is necessarily limited, I consider it a study and teaching tool primarily.

Third, supervised study is an excellent method of keeping up to date.

Included here are course work on campus, short refresher courses such as seminars and summer institutes, sabbatical leaves, and various fellowships. The principal values of this method are guidance by competent teachers and assumption of an obligation to complete a prescribed course of study. When pursued off-campus, there is a major advantage in experiencing a new and different academic climate. This method often requires a lightened teaching load or even absence from the campus. In view of the shortage of qualified staff, this may seem to be an insurmountable problem. But a greater problem will exist when teachers fail to keep up to date. Supervised study may be accomplished on-campus, but I believe that supervised study off-campus, if only once every five or seven years, can be the greatest stimulus to teaching effectiveness and academic proficiency.

Fourth, attendance at and participation in local, regional and national meetings is a must to keep oneself oriented, current, and forward looking. I do not mean that everyone must attend all meetings, but there seems to be a tendency for the same educators to appear at every meeting, and others to appear never. Have you ever been conscious of seeing the same old faces every time? Perhaps more schools need a rotational system for attendance whereby each staff member is given an opportunity to attend a meeting occasionally and even staff members who may not wish to attend would be required to do so. I believe this would benefit both the participant and the sponsoring organization. Two problems usually arise to prevent staff members from attending meetings. One is absence from school and the second is financial support. Arrangements for temporary absences from school should be made for each staff member, not only for attendance at meetings but for emergencies which may and usually do occur from time to time. Arrangements for financial support is probably a common problem at every school of pharmacy, and I do not have the answer. However, a rotational system will usually permit support for at least one meeting per year per staff member. I have known staff members who, lacking any source of travel support, maintained a fund of their own for this purpose.

The fifth and last method for keeping up to date is practical experience. Periodically, we need to compare our research activities and teaching duties with current practices and trends. This can best be done by on-the-job training and experience. Practical experience may be gained by observation for several days or by accepting employment for several weeks. The latter is far more valuable. This experience may be a teaching position in another institution, research work under someone interested in your area, or employment in a manufacturing company, hospital pharmacy, or retail pharmacy. Lack of time and inconvenience are the two major disadvantages of this method of keeping up to date. These same two disadvantages are common to almost everything we do. They can be overcome only by proper planning and motivation. Some individuals have argued against practical experience, especially the type gained in a retail pharmacy on the grounds that it lowers the reputation and esteem of the teacher and that time could be used more profitably in research or improvement of teaching. I do not advocate it as a substitute for research and improvement of teaching, but I feel rather strongly that experience, even in a retail pharmacy, is valuable to a teacher of pharmacy. I submit that a teacher suffers in reputation and esteem when

he purports to train a student for a position he himself could not occupy. A twenty-year old license plus twenty years of reading the proper periodicals does not qualify a person as a competent pharmacist today.

Obviously all of these methods cannot be utilized in all areas with which we desire to keep up to date due to limitation of time. At the same time, this limitation demands that we establish a program for utilizing the available time to best advantage. Such a program will recognize primary areas for greatest emphasis, secondary areas, and selected outside areas for lesser, yet definite emphasis, and other areas for remaining available time, if any.

In applying these methods, I would recommend a program along these lines. First, have a definite independent reading and study program. Prepare a check list of journals to be read carefully. Included in the list should be all the important journals in the primary areas and at least one journal in each of the secondary and outside areas. The check list should list each journal, frequency of publication, and a space for marking off each issue as it is studied. Abstracts should be made of every article of interest and filed by subject. In connection with journals, it is inconceivable that a teacher of pharmacy should fail to recognize the value of the *American Journal of Pharmaceutical Education*. We should recognize not only the value of reading it, but also of supporting it financially by personal subscription. Yet less than half of the staff members in schools of pharmacy have a personal subscription. Each staff member should also have a personal library of current editions of all standard reference books related to his primary areas. In addition, he should have one or two textbooks in each of the secondary and outside areas, available on his desk for immediate use or for take-home use.

The second feature of the program is research. Whether modest or ambitious, it should embody both personal and supervised research and should be designed to accomplish certain goals. A good research problem is closely related to one's own area of specialization, is closely related to the student's previous training, stimulates original thinking, utilizes a variety of techniques and equipment, and holds promise of significant contribution to the literature. A good research problem will teach research as well as produce research.

Supervised study is another important means of keeping up to date. This is not a continuous method as much as an occasional method. A good program will provide for some form of supervised study, either on-campus or off-campus, every year or two. This method of keeping up to date is difficult because we never seem to catch up enough to allow time for it. I submit that the time is far past when we will be sufficiently caught up to do anything that is not planned and adhered to.

The fourth feature is attendance at local, regional, and national meetings pertinent to your areas of interest. I feel that a staff member should attend most local meetings, and at least one regional and one national meeting annually. This is a minimum, without which we tend to become narrow in our thinking and slothful in spirit.

Lastly, practical experience should be gained. Like supervised study, this is not a continuous method as much as an occasional one. I look at

this as a form of supervised study, and perhaps should be treated as such. Thus a good program will provide for some form of either supervised study or practical experience annually.

A program such as this is difficult to achieve. It is almost impossible without a high degree of specialization in one discipline, such as pharmacy. Very few individuals can keep up to date in more than one discipline. That is why I look with disfavor on the practice of assuming multiple academic titles, such as Professor of Pharmacy and Pharmaceutical Chemistry, publishing textbooks by one individual in several different fields, and splitting teaching duties into several areas. In some cases this may be a matter of necessity or expediency. In a few cases, this is a tribute to the ability and competence of an individual. In most cases, it is an appeal to the ego.

Non-specialization, or rather specialization in several disciplines, would be ideal if it were possible. But the profession of pharmacy has expanded and progressed to the extent that few people can speak with authority in several areas. Frontiers of knowledge have been pushed forward to the point of demanding specialization if we are to function most efficiently not only in keeping up to date but also in pushing further these frontiers.

HOW TO KEEP UP TO DATE IN ORGANIC PHARMACEUTICAL CHEMISTRY

J. H. BURCKHALTER

It can be said accurately, if paradoxically, that those who do the least keep up the best. If a field is limited by its nature or if a teacher restricts himself to an inactive area, it is relatively easy for him to keep up. Unfortunately, this situation exists more often than we are willing to acknowledge. Some teachers keep up superficially by use of a textbook plus items from the popular press or from tertiary sources, such as brochures. On the other hand, it is impossible for a truly active, alert, conscientious teacher and researcher to keep up to the degree he wishes. The more deeply he becomes involved in keeping up, the more he finds to keep up with. This recalls the analogy of a circular spot of light. As it becomes larger so does the area of darkness. That is to say, the more information one acquires, the more he is induced to acquire. Also, the more specific and quantitative the information becomes, the more the time required for its compilation. It is one thing to reproduce the structure and use of a new therapeutic agent; it is quite another thing to extract from the literature the method of synthesis, mechanism of action and detailed pharmacological effects. An analogy from athletics can be seen in the fact that a number of agile young men can jump to a height of four or five feet without practice, but only one or two men through many hours of practice have ever jumped as high as seven feet; yet five feet represents 70 per cent of seventy feet. In other words, keeping up to the extent of 70 per cent probably requires less time and effort than the remaining thirty.

Keeping up to date can become such a frantic task that I should not be surprised someday to learn that one of my scientific colleagues had suffered a nervous breakdown during an unusually heavy flood of information across his desk. A heavy tonnage of materials comes to us during a year's time. An active teacher and researcher would be horrified to know the number of man hours each year he spends in merely handling informational items to say nothing of the perusal or careful reading of selected topics. Accumulation of mail during a vacation period provides a basis for the point just made.

I have been asked to present means of keeping up to date in organic pharmaceutical chemistry. I do not presume to say that these methods are the best ones. However, I hope my comments will stimulate you to think seriously about the problem and to work out ways which will conserve your time and produce gratifying results.

I shall divide the subject into four categories: (1) Keeping Up to Date for Minimal Teaching and Research, (2) Keeping Up to Date for Effective Teaching and Research, (3) Keeping Up to Date for Teaching and Research to a Desirable but Often Unattainable Degree, and (4) Keeping Up to Date Excessively.

KEEPING UP TO DATE FOR MINIMAL TEACHING AND RESEARCH

Keeping up to date for minimal teaching and research might have as a subtitle "Leading the Life of Riley." In other words, it is my opinion that keeping at hand the materials to be mentioned in this section and using them is not a very difficult chore. They can provide the necessary background for

minimal teaching and modest research efforts. In regard to research, one can always synthesize, or suggest that a graduate student synthesize, obvious analogs of well established drugs.

The following textbooks in pharmaceutical chemistry might be kept at hand: Wilson and Gisvold (1956); Jenkins, Hartung, Data and Hamlin (1957); Burger's *Medicinal Chemistry* (1960). The following compendia should be kept at hand: *New and Nonofficial Drugs*; *U.S. Pharmacopeia*; *National Formulary*; *Accepted Dental Remedies*, although the last book is not necessary. A good medical dictionary should be available, as well as some textbooks in organic chemistry, biochemistry, pharmacology, microbiology, etc.

One should subscribe to the following publications for reference in class as well as for stimulation of modest research problems: *Journal of the American Pharmaceutical Association* (Practical and Scientific Editions), *Chemical and Engineering News*, *Journal of the American Chemical Society*, *Journal of Organic Chemistry*, and *Journal of Pharmaceutical and Medicinal Chemistry*. Even such popular publications as *Time Magazine* and newspapers can provide an occasional inspiring word in class. *Organic Syntheses*, *Organic Reactions*, and *Organic Chemistry* (Gilman) are series books which should either be in one's office or readily accessible in a library. *Chemical Abstracts* and "Beilstein" should be available. However, it is well known that "Beilstein" is many years behind in abstracting, and *Chemical Abstracts* subject index is from fifteen to twenty-eight months behind the appearance of the general article. The last mentioned compendia are particularly helpful in a research program for obtaining information retrospectively. *Chemisches Zentralblatt*, the German publication, is similar to *Chemical Abstracts*. It is valuable as a cross check against the American publication.

One who intends to keep up to date even to a minimal extent should make an attempt to attend every year or so meetings of the following organizations: American Pharmaceutical Association, American Chemical Society, and American Association of Colleges of Pharmacy.

In keeping up to date, I have found that it is very convenient to maintain separate folders for each category of information. For example, there is a folder for the subject of antihistamine agents. If a new item concerning antihistamine agents is noted in *Chemical and Engineering News*, I tear out the sheet concerning this subject and place it in the folder entitled "Antihistamine Agents." If the information is contained in a journal or book which I wish to preserve, I obtain a reprint of it or transcribe the information by means of Thermo-fax, typing, or longhand writing. When the time comes for a discussion of antihistamine agents in class, I incorporate the new subject matter into my lectures. Of course, the constant addition of new information causes a constant reassessment of the subject matter to be presented in class. Information concerning drugs of lesser interest will probably be abridged and greater stress will be placed upon the newer and more widely used agents of the category.

KEEPING UP TO DATE FOR EFFECTIVE TEACHING AND RESEARCH

A number of texts which are printed outside the United States can be very helpful as cross references and as a means of gaining new interpretations regarding drugs. For example, *May's Synthetic Drugs* by Dyson, a book by Fleck as well as one by Evers and Caldwell are to be considered. Kaufmann's

Arzneimittel-Synthese is another well known text. The following books should also be mentioned: the series entitled *Medicinal Chemistry*, Vols. I-IV by Suter, Blicke and Cox, textbooks on chemical pharmacology such as that of Barlow, books on enzyme chemistry, *The Basis of Chemotherapy* by Work and Work (1949), *Steroids* by Fieser and Fieser (1959) and *Chemistry and Physiology of the Vitamins* by Rosenberg (1945). Admittedly some of these books bear old dates, but they represent important contributions in the implied field. The book on steroids is already established as a classic.

The organic pharmaceutical chemist is obligated to be familiar with modern organic chemical theories, particularly as they relate to drugs. Effective teaching can not be done without an understanding of such topics as conformational analysis and stereoisomerism. Incidentally, we have found that Dreiding Stereomodels which may be purchased from G. M. Instrument Company, Greenville, Illinois, are excellent for this purpose. The use of such models will show both student and faculty the interesting structural differences between, for example, the cardiac glycosides and the steroid hormones. The structural relationships between morphine and its synthetic analogs can also be more fully appreciated by means of these models.

Merck Index (1960), *Modern Drug Encyclopedia* (1958) together with its bimonthly supplement, *Modern Drugs*, and supplements to *New and Nonofficial Drugs*, as noted in the *Journal of the American Medical Association* are important adjuncts to effective teaching and research. Also, it is well to acquire the abstracts of the meetings of the American Chemical Society, The American Pharmaceutical Association, Gordon Research Conference, Ciba Symposium, etc.

The following books which appear as series should be helpful to the average worker in our field: *The Alkaloids*, by Manske and Holmes (Vol. I-VII), *Heterocyclic Compounds*, Elderfield (Vol. I-VI), *Heterocyclic Compounds*, Weissberger, and *Physical Methods of Organic Chemistry*, Weissberger. I feel that it is mandatory when we present the structure of an alkaloid or other natural product that the structural information be absolutely up to date. The most recent information on alkaloids, outside of original journal articles, can be found in the series by Manske and Holmes. No longer can we be neglectful of our students to the extent that we merely represent a structure in two dimensions.

I subscribe to a number of the following journals, and after I have examined the table of contents, read a few of the articles, and made a few notes for my file, I indicate by a mark on the cover that that particular number has been noted. For journals to which one does not subscribe, a check list can be used. A check mark is made opposite the name of the journal and under the date of issue after the journal has been read or examined. Journal Check List:

Journal of Chemical Education, *American Journal of Pharmaceutical Education*, *Journal of the Chemical Society*, *Chemische Berichte*, *Helvetica Chimica Acta*, *Science*, *Lancet*, *Chemistry & Industry*, *Tetrahedron*, *Journal of the Pharmaceutical Society of Japan*, *Archiv der Pharmazie*, *Arzneimittel-Forschung*, *Antibiotics & Chemotherapy*, *Journal of Pharmacology and Experimental Therapeutics*, *Pharmacological Reviews*, etc.

It is obvious from the inclusion of a number of foreign journals that one must have reading ability in foreign languages. I am one who strongly believes that reading knowledge of at least German and French is essential for keeping

up in our field. Although a library may furnish the services of a research librarian, I do not feel that I have completely become acquainted with the subject matter of an important article unless I have examined it first hand.

The Chemical Abstract Service, The Ohio State University, Columbus 10, Ohio, furnishes two valuable sections under separate cover: *List of Periodicals Abstracted by Chemical Abstracts*, and *The Naming and Indexing of Chemical Compounds by Chemical Abstracts*. Then there is a book entitled *Ring Index*, by Patterson and Capell. These works are helpful not only in keeping up to date; they are particularly valuable in connection with the reporting of research results. *Ring Index* is essential for keeping up properly with the naming of nuclei of many new biologically active substances.

We have found that student seminars help graduate students as well as faculty in keeping up with modern developments in our field. Each graduate student is required to prepare a topic each semester, and he is graded upon the presentation and the abstract he prepares. We insist that he quote his references after the style of *Chemical Abstracts* which is indicated in the first of the three books just mentioned. Informal faculty seminars held, for example, once a week during the lunch hour also produce many worthwhile results. Each week a different member of the faculty may present a subject of interest to him either taken from the literature or from his own research efforts.

If you happen to be so fortunate as to receive private abstracts of a pharmaceutical company, keeping up is made easier for you. It is quite a chore, for example, to read religiously *Chemical Abstracts* as the successive issues appear. As we indicated earlier, there is a period of many months between the issuance of a journal and appearance of the index of *Chemical Abstracts*.

I think that effective teaching and research require attendance during the year at about two meetings of the type referred to in the first section.

In presenting information in correct and up-to-date fashion, one can not afford to be without a recent book published by Fieser and Fieser; it is *Style Guide for Chemists*. This book should be read and reread and I am sure that the editors of journals, as well as the audience which must hear us, will be eternally grateful if we make use of this valuable book. In my opinion every graduate student should be required to purchase and use the guide in the preparation of progress reports, seminar abstracts, and theses.

KEEPING UP TO DATE FOR TEACHING AND RESEARCH TO A DESIRABLE BUT OFTEN UNOBTAINABLE DEGREE

A higher order of keeping up to date demands more of the materials which were listed under the first two sections. For example, a wider variety of textbooks in one's field as well as allied fields would be required. The following special monographs are illustrative of the types that one might have at hand or in the library: *Bacteriostatic Activity of 3500 Organic Compounds for M. Tuberculosis*, Youmans, Doub and Youmans (1953); *Sulfonamides and Allied Compounds*, Northey (1948); *The Chemistry of Penicillin*, Clark, Johnson and Robinson (1949); *The Strategy of Chemotherapy*, Cowan and Rowatt (1958); *Survey of Antimalarial Drugs*, Wiselogle (1947); *Recent Advances in Chemotherapy*, Vols. I, II, III, etc., Findlay; and *Annals of the New York Academy of Sciences*.

The Special Publications Department of the American Chemical Society in

Washington has made available a number of helpful brochures for those interested in research in the chemical literature. They are entitled: *Search in the Chemical Literature*, *A Key to Pharmaceutical and Medicinal Chemistry Literature*, *Chemical Nomenclature*, etc. *A Guide to the Literature of Chemistry* by Crane and Patterson (1957), and a *Short Guide to Chemical Literature* by Dyson (1958) are also valuable.

Some pharmaceutical chemists use the following abstract journals: *Excerpta Medica*, *Abstracts of World Medicine*, *Federation Proceedings*. For those interested in cancer, the Cancer Chemotherapy National Service Center of the U.S. Public Health Service will furnish *Cancer Chemotherapy Abstracts* as well as other materials. *Current Contents*, a weekly list of tables of contents of about five hundred journals in chemistry, pharmacy, and medicine is being used by a number of scientists in various laboratories. Among the indexes perhaps the best is *Current List of Medical Literature*, published monthly by the Armed Forces Medical Library. It is up to date, and journal articles are indexed during the same month in which they appear. Other indexes are *Quarterly Cumulative Index Medicus*, *A.Ph.A. Handy Drug Reference* and *American Drug Index*; the last is an annual book by Wilson and Jones.

Popular publications of possible value are *Modern Medicine*, *Medical News* (Ciba), *Scope Weekly* (Upjohn), and *Drug Trade News*.

The annual *Year Book of Drug Therapy* by Beckman (1960) outlines his opinions on over three hundred new drugs introduced during the previous year. *Unlisted Drugs*, published by Special Libraries Association, bridges the gap between the first mention of a drug in a literature and its listing in a compendium. *Facts and Comparisons*, published by Kastrup of St. Louis, may also help one in keeping up to date. Company brochures and package slips in drugs are also valuable sources of information.

The new *Index Chemicus* should prove to be a boon to the chemist who wonders if the compound he plans to synthesize is new. It should close the gap between the appearance of the formula index of *Chemical Abstracts* and the present. Published monthly by the Institute for Scientific Information, Philadelphia 23, Pa., it will cost educational institutions \$250.00 a year. *Chemical Titles* is a new publication being launched by the American Chemical Society. Twice a month current author and key word indexes from selected chemical journals will appear. The writer has examined an experimental issue without reaching the conviction that the system will be a practical one. Such scanning may exert a soporific effect. The new *Pharmaceutical Index* has also been mentioned as a means of keeping up, but the writer has not yet examined it.

Some of the most significant research being done today involves studies which cross over into related areas. When my colleagues in pharmaceutical science complain that we can not keep up with organic chemists in the synthesis of drugs and natural products, I lose patience. Usually, the horizons of the organic chemist have not reached the area of biological phenomena. Chemists in a pharmaceutical environment do not fully recognize their advantageous position. Perhaps they are not qualified to make significant contributions in theoretical chemistry, but they should realize their potentialities in the fusion of physical and biological sciences. Think of the substance and glamour in the total synthesis of oxytocin by du Vigneaud! The chemistry and biology depended upon simplicity, but fused together there was a sort of synergism which

won him a Nobel prize. It is hardly necessary to add that one must keep abreast of knowledge in related areas if he is to achieve similar results.

In keeping up to a desirable extent, one should attend regularly meetings and seminars in allied fields as well as in one's own field. However, there can be a point beyond which too much time is being spent away from primary obligations to students and research.

KEEPING UP TO DATE EXCESSIVELY

A winning poker player knows when to fold his cards during the dealing of a hand. A successful teacher and scientist also knows when he is beginning to invest too heavily his time and energy in potentially unrewarding ways of keeping up to date. Keeping up with many textbooks, monographs, abstracts, journals, meetings, etc., may involve so much effort that there is insufficient time left for preparation of lectures or actual pursuit of research.

The practice can also stifle creativity. The great advances in science are usually made by young men who are full of energy and who do not allow their imaginations to be bridled by the literature.

I shall briefly describe three individuals whose productivity was greatly curtailed by too much keeping up to date.

Biochemist who spent every afternoon in the library. His lectures were excellent, but he was so imbued with what others had done and were doing that he was incapable of having an original idea.

Extremely well trained pharmacologist. His wide and up-to-date reading caused him to become philosophical about research. He rationalized that novel developments were so hard to accomplish, as judged by the literature, that he decided to do nothing but keep up to date and vegetate!

Plant chemist who was a walking card file. He spent all time aside from that required in the classroom in maintaining an elaborate card file of the literature so as to prepare himself to do research. He never got up to date, so he never commenced research.

What is the danger zone in attendance at meetings? Individuals differ. There might be a genius who finds that meetings disturb his productivity as an introspective scientist. I knew one of this type—a pronounced leader in his field and also an excellent lecturer. Can one demand more of any teacher? On the other hand, certain individuals need the stimulation of regular attendance at meetings.

More important than keeping up to a so-called proper level is inspirational teaching and creative research. If, by failure to gather data beyond *New and Nonofficial Drugs*, one can be a more inspiring teacher, by all means he should stop at that point. If by not bothering to read abstracts regularly one can find time to do more creative research, by all means he should do that.

My final words of advice are: know thyself! Keep up enough, but not too much. The net result will be effective teaching and research.

HORIZONS IN GRADUATE EDUCATION

TRENDS IN GRADUATE EDUCATION

DAYTON D. McKEAN

It should be possible in a few months to discuss trends in graduate education with a degree of certainty that we do not have today, because in September the publication is expected of a big study of the subject by Bernard Berelson. His research was supported by a substantial grant from a foundation; he conducted many interviews with deans of graduate schools, other university officials, professors, and students. In addition, he collected data by means of one of the most comprehensive questionnaires I ever saw; of the two that I filled out for him, one was a substantial pamphlet.

Most deans of graduate schools were willing to cooperate with Berelson because our present knowledge of what is going on is impressionistic and incomplete. Our data are unreliable; for example, there is no uniform definition of a graduate student, and consequently no one can say with certainty how many graduate students are enrolled. A common guess is 375,000, but anybody, by changing the definition of a student (say to full-time) may change the figure to suit himself. The United States Office of Education attempts to collect statistics on the number of graduate and professional degrees annually awarded, but since the office has no authority over the reporting institutions, no pretense is made that the figures are accurate or complete. For these and other reasons, any discussion of trends in graduate work, including this one, must be based upon little more than guesswork, upon what deans discuss at their conventions, and upon what they report in their newsletters. I will offer (with little confidence) a list of what I think are current trends, knowing that any other dean you brought here might have a different list, and that Berelson's report may make ridiculous anything I say.

First, we might find the widest agreement on the generalization that the vast, rapid, and accelerating accumulation of human knowledge is making graduate education more and more necessary to anybody who pretends to competence in almost any field of knowledge. Much evidence supports this hypothesis. Companies that were willing, a generation ago, to employ as a chemist a man with a B.A., now insist upon a Ph.D. and prefer some postdoctoral work. Their reasoning is that the study of chemistry has gone so far and so fast that a man with less knowledge than the Ph.D. represents is not at the level that they need. A recent librarian at Harvard estimated that there are 5,000 journals in chemistry now published. In other fields besides chemistry the bound volumes of periodicals march in unending lines down the library shelves, and new journals are being established every month. So great is the quantity of knowledge that the old jokes about the physician who specialized in the left big toe have somewhat lost their point: to know all about one subject, that subject must be a specialty. This is no age for a Di Vinci or a Jefferson; it is the age of the expert. There is one

man in my own field who has confined his research to American ballot forms; another who has worked only on that old curiosity, the electoral college; and still another who has chosen proportional representation as his specialty. I daresay that sort of thing is what has to be done in any subject.

A second trend is associated with the one I have mentioned. Apprenticeship training and specialized schools maintained by employers are diminishing. Both the professions and the corporations seem generally to prefer the graduate work done in universities to that which they used to do for their own people. In spite of the jibes about the Ph.D. being the professors' union card, the facts are that more holders of the doctorate are being employed for work outside than inside colleges and universities. The *New York Times* is reported to have forty Ph.D.'s, and I know not how many masters, on its staff. Of the 9,000 or so academic doctors coming out of our universities every year, only about 4600 are net additions to the supply of college teachers. In a speech he made last year Bernard Berelson (1) lifted a corner on the results of his research in commenting upon the increasing demand for the Ph.D.'s in non-academic life:

Around 2900, from 70-80 per cent of all employed doctorates were in college and university positions. In the late 1920's the figure was 70-75 per cent, in the 1930's it was 65 per cent, and in 1958 it was 60 per cent. Two important points emerge at once: first, doctorate holders are not now employed overwhelmingly in colleges and universities, but only a small majority of them; and, second, the long-run trend is running against employment in higher education And field by field across the board, fewer recipients of the doctorate are now going into higher education than did only two decades ago—the biological sciences are down seven or eight percentage points, and the social sciences, humanities, and professional fields are down three to five percentage points. So if one were going to model training on subsequent activity, much of the training in the graduate school and especially in the sciences (where the problem is presumably most severe) would be directed away from academic teaching, not toward it.

Possibly this would be a good point at which to call attention to a third trend which I may label, because a better term does not occur to me, the increasing professionalization of graduate education. The attainment of a Ph.D. in chemistry is as much the way to employment in the chemical industry as obtaining the M.D. is in medicine; such is the situation already. In addition, however, the graduate schools are awarding fairly new degrees, the very names of which indicate their professional characteristics: Doctor of Business Administration, Doctor of Education, Doctor of Musical Arts, for example. We have a unique professional master's degree at this university: Master of Personnel Service. I do not know how many graduate professional degrees are offered by American graduate schools; I would guess, about twenty-five. Our graduate faculties, conservative in most respects, appear not to be reluctant to create a new master of this or doctor of that when a demand from industry, government, or a profession appears. In his *Education for the Professions* Lloyd E. Blauch (2) has summed up this whole trend:

It should also be noted that students in the graduate schools engage in highly specialized study in particular fields in which they will later earn their living. There is ample justification, therefore, for regarding the graduate school as a professional school; perhaps it should be thought of as an undifferentiated professional school, since it offers preparation for a number of fields of work.

In view of the trends mentioned, you might expect another: increasing enrollments in graduate schools. But in view of the shaky statistics we

have, I am not sure whether enrollments are going up or holding about the same as they have since the end of the GI bulge after the war. At their meetings, some deans of graduate schools report increases, others actual decreases. An unknown number of graduate schools have enrollment limitations, either on the total number of applicants accepted, or by quotas imposed by the departments; their totals, obviously, do not change. By the device of raising standards for admission others are slowing down any increase they might otherwise have had. The graduate school at this University has been increasing about 15 per cent per year; it has been growing at about double the rate of the University as a whole. Our situation, however, may be unusual.

Whether there are more graduate students or not, increasing support for them seems clearly observable, and this trend, I hope, will continue; for it has a long way to go to meet the need. Although universities and corporations have increased the number of fellowships they offer, the total they have been able to provide is still tiny compared with the number of students who cannot finance their advanced education. The Woodrow Wilson Foundation offers 1000 one-year fellowships for students who say they have an interest in college teaching as a career. The financial position of many graduate students is worsened—sometimes made desperate—by the tendency they share with other contemporary college students to marry early and to start families at the same time they start on degrees. Berelson may have some statistics on the number that are married and on the size of their families. The federal government has done the most on the problem of helping able but inpecunious graduate students; its fellowship programs under the National Science Foundation, the National Institutes of Health, and the Defense Education Act have been excellent. By providing allowances, even though modest ones, for dependents, the national government appears to be encouraging bright students to marry and to have children.

A fifth trend I notice is an annual increase in the charges for fees and tuition. This one applies to undergraduates, of course, as well as to graduates. There was a time when many universities, recognizing the characteristic poverty of the graduate students, charged them lower rates than undergraduates. But perhaps because many fellowships pay the student's tuition, whatever its amount may be, besides providing a stipend for him, university financial officers may be showing a tendency to charge all the traffic will bear. Few universities charge graduate students less than they charge others. Many state universities have been pushing up their tuition rates for non-resident students to very high levels, partly as a means of raising money, partly as a device for discouraging non-residents. These increases have the unfortunate effect of discouraging student mobility, for unless he has some kind of scholarship or fellowship, the typical graduate student simply cannot pay six or seven hundred dollars tuition. Nor can he borrow that much, plus enough to live on—not even under the Defense Education Act.

Having made the graduate student's financial position nearly impossible, many universities hold out to him the bait of total or partial remission of his tuition if he will become a teaching assistant. For doing about twenty hours a week teaching—about double the number of hours required

of a full-time teacher—the graduate student will be paid \$1800 to \$2200—about half the amount that the university would pay to a full-time instructor. Thus many universities get large proportions of their undergraduate teaching done at a low cost. They commonly accompany the exploitation with pious recitals of the value to the graduate students of the teaching experience, in spite of the fact that fewer than half of the students will ever teach after they earn their doctors' degrees. They teach while they are in graduate school only because they must, and the accounts of the effects of their teaching upon undergraduates are appalling. This part-time teaching drags out the attainment of three-year degrees to six and eight years, and society loses that many useful years from this group of unusually able people. The graduate schools, it must be said for the sake of fairness, are usually helpless to protect their students, for the central administration can withhold the needed funds for scholarships and fellowships by pleading that most universal of all academic defenses, lack of money.

When, therefore, the president of an undergraduate college announces that the time has arrived for his school to introduce graduate work, persons who are experienced in translating the language may well be justified in turning his statement into English to mean that he does not see how, five years from now, he will be able to hire enough competent, full-time instructors, or how he will pay them if he can find them. But by introducing graduate work, he hopes to get much of the necessary teaching done by graduate students at a cost that can be met from the tuition money paid by undergraduates.

A sixth trend I have noticed is an increasing pressure, based upon financial considerations, against traditional methods of graduate instruction such as the seminar, individual supervision of graduate research, the thesis and the dissertation. University financial officers love to calculate the costs per credit hour produced, and of course a seminar with five students, taught by a professor, will cost as much as a lecture course for 500 students taught by the same man. The pressures come from outside, too; one of our sovereign states recently passed a law, no less, that no course in its state university shall be taught to fewer than twelve students. There is also great reluctance to provide the funds necessary to buy for graduate students the materials, supplies, equipment, and so on that they need for their research. But here again the federal government has come to the rescue; unknown thousands of graduate students in the sciences get what they need by way of federal research contracts. Graduate students in the humanities and social sciences are less fortunate.

A seventh trend I have observed is the application of undergraduate courses toward graduate degrees. If carried far enough, this tendency could make graduate and undergraduate work indistinguishable, and graduate degrees would be awarded for prolonged undergraduate careers. The problem so far has arisen chiefly in special masters' degree programs for secondary school teachers. These people commonly do not have the necessary undergraduate prerequisites for graduate courses, or they took the undergraduate work so long ago that what remains of their knowledge is outdated, obsolete. Since most of them have bachelors' degrees, in order to obtain the increases in their salaries that follow further college work, they

must get graduate credit for what they do. So some graduate faculties have created special masters' degrees—Master of Arts in Teaching, Master of Basic Science, Master of Social Science, for example—which permit junior, even sophomore, courses to be used toward degrees, or which accept refresher courses.

Unsure as I am about some of the trends I have mentioned, I have saved the most uncertain to the last. This is the accreditation of graduate work. Graduate schools commonly require for admission that students must have bachelors' degrees from undergraduate colleges approved by one of the regional accrediting associations, but to my knowledge only the North Central Association of Colleges and Secondary Schools accredits member institutions separately for graduate as well as undergraduate degrees. They do it, not program by program, but for the institution as a whole; whereas, professional associations are interested largely if not entirely in the programs leading to their degrees and in most instances to state licensing examinations. All of the professional examiners, so far as I know, stop with accrediting undergraduate professional programs; but I have come across instances in which professional schools were strongly advised by examiners not to get into graduate work until more faculty possessing the appropriate graduate degrees were employed. This is not enough evidence, I am afraid, to establish a trend. We may, however, be justified in expecting that professional associations will take increasing interest in the amount and quality of the graduate work done by the teachers in the professional schools the associations evaluate. A simple, though of course not entirely satisfactory, measurement of instructors' attainments is the graduate professional degrees they have earned. One of the questions an accrediting team invariably asks is, how many members of the faculty have the appropriate terminal degrees? Accreditation commonly rests upon a variety of factors, but the failure of a substantial proportion of a school's faculty to attain graduate degrees will at the least produce an adverse comment in the report.

Here, then, are a number of possible trends in graduate education. Whether, if they are real tendencies, they will continue or not will be interesting to watch; for the situation in graduate work is, as the diplomats say of world affairs, fluid.

REFERENCES

- (1) Gustad, John W. (Editor), "Faculty Supply, Demand, and Recruitment," New England Board of Higher Education, Winchester, Mass., 1959, p. 86.
 - (2) Blauch, Lloyd E., "Education for the Professions," United States Department of Health, Education, and Welfare, Washington, D.C., 1955, p. 9.
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GRADUATE EDUCATION IN SCHOOLS OF PHARMACY

MELVIN W. GREEN

When I was assigned this topic, I found myself in the position of the clergyman who had to preach on "Motherhood" or the politician assigned to talk on "the Grand Old Flag". There is no limit to what may be said on these time-honored and important topics and neither is it possible to say anything new.

Not far from Boulder they tell me there is a place where, for fifty cents, you may pan for gold and keep all of your findings. In twenty-five odd years of such panning few have gone away without a little gold dust, but no one has had a strike large enough to pay his admission fee. It is planned that way. As you listen to this paper, I hope each of you will receive a bit of gold to take back with you, but if you hope for repayment of your registration fees you will be disappointed. Your committee planned it that way.

I suppose one of the best ways to introduce a talk about graduate work in pharmacy colleges is by a look at its parameters. It is of some profit to look at graduate work in terms of size and boundaries.

Graduate work in pharmacy is relatively new. Graduate work in the pharmaceutical sciences is retracing the pattern of graduate work in this country generally. While the cycles are the same, we are not in phase, for such activity was delayed in pharmacy. History records that the first Ph.D. in a pharmaceutical science was granted by the University of Wisconsin in 1902. This has been followed by a rather lengthy period of pioneering from which we are only now emerging. In 1902, graduate work, generally, had passed from the pioneering phase, according to Hollis, to a period of standardization which was later superseded by a period of changing purposes.

In 1927, according to Jenkins, nine schools offered a standard academic master of science degree and only four offered the doctor of philosophy. Current figures show that forty-two schools offer the master's degree in pharmacy, forty-four in pharmaceutical chemistry, thirty in pharmacognosy, forty-four in pharmacology, seventeen in pharmacy administration, and twenty-six in hospital pharmacy; fifty-two schools offer the degree in one or more areas. The number of schools offering the Ph.D. has increased materially also. Twenty-four schools currently offer the Ph.D. in pharmacy, thirty-three in pharmaceutical chemistry, nineteen in pharmacognosy, thirty-two in pharmacology, and fourteen in pharmacy administration; a total of thirty-five schools offer the degree in one or more of these fields. All of these figures are slightly inflated by the presence of those schools that really offer the graduate work through the appropriate department in one of the related schools of the university rather than in the school of pharmacy.

The number of students in graduate programs has increased significantly, also. Accurate figures do not appear to be readily at hand for the earlier years. In 1945, in part due to the nearness of the war, the total number was reported to be only eighty-five by DuMez. During the last decade the number has been in the 600's; in 1959-60 it is reported officially to be 872, an all-time high.

In the earlier days, graduate work was largely in the area of pharmaceutical chemistry, although it was not always designated as such. Pharmacognosy and pharmacy soon entered the picture. Pharmacology appeared somewhat later as it is a relatively new science. Only comparatively recently has pharmacy administration been offered as an area of graduate instruction. It is of interest, and no little importance, that one school of pharmacy offers graduate work in the history of pharmacy. Hospital pharmacy is an area of specialization found in many schools today. In addition, persons with a baccalaureate degree in pharmacy have elected to go into graduate work in many other fields outside of the school of pharmacy: bacteriology, chemistry, physiology, sociology, and psychology to mention a few.

Certainly a very reasonable question for both a college and a student to ask is "Why graduate work?" Any college that sincerely and vigorously attempts to prepare young men and women to meet the needs of the profession today has its hands full without graduate work. The problems of the undergraduate level are many and they appear not to have simple solutions. Certainly students who have graduated from a professional program have no lack of challenge in the profession wherever they chose to practice.

The advantages of graduate work were succinctly stated in 1945 by Dean Jenkins who stated:

It causes the faculty to reassess the fundamentals of knowledge because every graduate teacher must keep abreast of his own and related fields. It provides an opportunity for working out methods of thought and procedure useful in all fields of instruction. It raises the general intellectual level of the staff because no teacher can long instruct eager and superior young men and women at the graduate level without continuous and assiduous self-improvement. Some claim that it enhances the reputation and prestige of the school. This advantage is often over-emphasized; it is the improvement of teaching techniques and faculty growth that makes the reputation of the school.

In addition, it is recognized that much of pharmacy's leadership must come from those with higher degrees. Those people graduated at the Ph.D. level particularly will become our deans and teachers in colleges of pharmacy as well as research workers in various places. That this is actually the case can be proved by at least two citations.

You are all familiar with the fact that the American Foundation for Pharmaceutical Education promotes graduate research and teaching by a system of financial aid to a number of Fellows each year in the various graduate schools. In 1956, the Foundation recapitulated its findings concerning the placement of former Fellows. It is interesting to note that at that time nine Fellows had become deans and directors of colleges of pharmacy, sixteen were professors, fifty-one were associate professors, seventy-six assistant professors, and seventeen were instructors, lecturers and associates in colleges of pharmacy. In addition to the number, which is certainly impressive, that are located in pharmaceutical education, it should be noted that seventy-four Fellows were research and development scientists in the drug industry and seventeen were in military research and health service fields of the U.S. Government. Obviously the Foundation, through its support of graduate research, has made a tremendous contribution to the production of leadership in the pharmaceutical field.

A second citation, of a little different nature, is that of an analysis of

twenty-five years of graduate work at Purdue University made by Donald W. Harding and Glenn L. Jenkins in 1951. It is of interest to note that eleven persons with the M.S. and thirty-one with the Ph.D. from Purdue were then reported as being deans or in teaching positions in colleges of pharmacy and one Ph.D. was, at that time, a postdoctorate research fellow, while twelve persons with the M.S. were continuing graduate work. A number of persons with the M.S. and Ph.D. were in industry in various capacities. There was one person with an M.S. in advertising, there were three with the M.S. in product development and control and seven Ph.D.'s in the latter field. Four persons with Master's degrees were in production and one with a Ph.D. was in the same field. Three persons with an M.S. and fourteen with a Ph.D. were in research and one with an M.S. was in sales. Two persons with the M.S. were in public health, either in control or research, and three persons with the Ph.D. were in like positions. Eleven persons with an M.S. degree were in retail pharmacy and one in hospital pharmacy. Those persons who were teaching were in thirty-one different institutions, and the thirty-four people in industry were distributed throughout twenty-five different companies.

Obviously twenty-five years of graduate work at Purdue has enabled the university, through its graduates, to influence many facets of pharmaceutical endeavor by the production of leaders. Many other graduate centers have records equally or even more impressive, and this is cited as an example because it was the only record at hand. Certainly a university is in a fine position to influence the field of pharmacy in many ways and in many places when it undertakes to develop a strong graduate program.

Possibly it is these cited advantages, and others, that have led to the increase in the number of schools offering graduate work. Many have expressed concern about the number of schools doing so. The fear has been expressed that schools with much yet to be done at the undergraduate level will dilute their efforts at the undergraduate level. Some feel that certain schools are unable to finance graduate work properly and this is, indeed, a costly area. Some point out that some schools offering only master's programs do not stress sufficiently certain fundamentals like calculus and physical chemistry at such a level that the students can move on to another school for a Ph.D. without considerable loss in time. And so on it goes.

Counter to these arguments are the strong desires of many faculties to offer at least a master's program on a modest basis in one or more fields. They wish to get some of the previously cited advantages, and they point out that it is often very difficult to attract and to hold a strong faculty if they cannot do something in this area. This is related to the professional growth of the staff.

I do not believe that this difference in viewpoint is irreconcilable nor one to be viewed with alarm. It is a little like two people seeing the same glass half full of water. One says that the glass is half full while the other says that it is half empty. Both people are telling the truth and it matters little which one you believe. The last time I used this illustration one of my friends said that both people are lying since a glass half-filled with water ordinarily does not have a vacuum in the other half of the glass!

This probably illustrates what we will be up against when we include more general education in the curriculum!

Now that the graduate program has advanced to this point, what are some of the problems to be faced? First, peculiarly enough, one of the major problems is recruitment despite the largest enrollment in history. While there is ample evidence gleaned by Dr. Rudolph Blythe, by the Committee on Graduate Studies of the AACP, and others that we can find employment for all we are able to produce at the graduate level at the moment, our capacity appears to be somewhat above our enrollment so that we need actual numbers. But quantity is not as important as quality in these areas, and we need many more of the more able students to go into graduate work.

Failure to attract more able students into graduate programs is not unique to pharmacy and the causes for this failure have been amply discussed by President Harold Taylor of Sarah Lawrence College. Dr. Taylor points out that if each child is to grow up to take his rightful place in American society, he must have access to good education throughout his entire childhood so that his latent talents can be revealed and nurtured. Beyond this, however, is personal motivation which determines whether he makes the effort to go further with his education. Personal motivation may come from such sources as the amount and quality of general conversation at the family dinner table, the ambition of a mother for her sons, or the stimulus of an outside, rather casual contact.

The pattern of values and attitudes in the family is quite varied among people in different income and social groups. This has a definite bearing even on recruitment for college let alone for a profession or additional graduate education.

A second factor is motivation in the public image of the profession. Studies have shown that the public image of the scientist and the teacher is not especially good in the United States at present. One of the chief referents in such image making unfortunately is income. There are signs of improvement in these images, fortunately.

A third factor is the educational system itself. Where schools and colleges build different attitudes within their communities, and where teachers themselves serve as models for the significance of the intellectual life and its achievements, the impulse to continue learning is often strong enough to overcome the force of contemporary American society as it shapes the ambitions of youth.

Taylor sums up the situation in these words:

the motivation of individual students for further education lies deep within the culture and is strongly conditioned by economic and social factors which determine the patterns of ambitions for Americans as a whole. Among the variety of opportunities for the use of genuine talent, those connected with teaching, scholarship, research and the creative arts are singularly less well rewarded economically, and therefore socially, than the other professions and occupations. The counter-force lies mainly within the idealism and integrity of the academic profession itself.

However, the teaching profession as now constituted does not possess leverage powerful enough to overcome the social and economic forces which move the talented among the young into professions of greater reward, if not greater prestige.

It is clear that unless we have in our graduate schools a large proportion of the most talented of the younger generation, we will not be able to develop the imagination and the intellectual energies of the country to a level sufficient to meet the social and cultural challenges of the future.

Recently, in another connection, I have had occasion to determine the undergraduate source of our teachers. There are, apparently, eleven schools who have never produced a graduate teacher. There are several other schools that have sent only two or three students into graduate work and, subsequently, into teaching. Some of these schools are strictly undergraduate and have a difficult time maintaining their faculties. It would seem that such schools have a special obligation to add to the stockpile of teachers for their own best interests. Peculiarly, the strictly undergraduate school is not alone in failing to meet this challenge, however. One school, which has produced a rather large number of Ph.D.'s in the pharmaceutical sciences, has had only three of its own undergraduate students undertake graduate work at any institution in the last five years.

The recruitment of the most able youth for graduate training is one activity for which there must be no relaxation if pharmacy is to continue to progress.

The second major problem is one of finances—financial assistance for both the students and the schools. If we do not succeed in getting more funds for students we will simply limp along, as we have in the past, without attracting and holding enough of the better students. Today's young people marry early and raise families earlier. We may wish it were different, but we can only wish. The facts are there. I had occasion to note the roster of graduating seniors of one of our colleges recently. Out of a class of thirty students, fourteen (nearly one-half) were married and had, collectively, sixteen children.

Graduate fellowships should be \$3500 to \$4000 or, at least some of them should, to do the job. It is a two-fold answer we are seeking, money for more fellowships and money for greater individual stipends.

Money is badly needed for operating the graduate program. Most schools have no separate operational budget in this area at all. In many cases, the graduate program is simply living off of the undergraduate supply and equipment budget in the traditional Peter vs. Paul manner. In some instances this has not posed too severe a hardship for the school has been able to get its budget in these categories to a reasonably high level over the years. Schools which are attempting to develop or expand a graduate program are faced frequently with a severe problem in this regard. Only, this past semester, two out of five schools examined by the Council expressed concern about this matter.

Again this is not a problem peculiar to pharmacy but is university-wide. After all the graduate school is a professional school of a very high order comparable, if not superior in its importance, to law and medicine. Universities are going to have to find ways of budgeting the graduate school on a level that it deserves. This is not easily accomplished.

Equipment, likewise, is somewhat of a problem. Many schools have research foundations, other organizations and administrative devices for making special equipment available when it is needed. Some fail to get

such equipment because they fail to demonstrate the specific clear-cut need at the time of request.

Money for the support of graduate work and research does not come exclusively from the universities themselves, however. In 1959 the speaker published the results of a survey on the extent of such support in colleges of pharmacy for the two academic years 1956-57 and 1957-58.

The survey showed the receipt of forty-three grants from foundations during the two years covered by the survey, eighty-eight grants from industry, forty-eight from the Federal Government, one from the National Research Council, five from voluntary health associations, five from state pharmaceutical associations, and five from miscellaneous sources. The total value of all such grants in the academic year 1957-58 was \$830,264. Industry supplied \$205,557 of this, private foundations \$134,736, the Federal Government (principally the U.S. Public Health Service, the National Institutes of Health, and the Armed Forces) \$377,568, state government agencies \$9,586, health associations and foundations \$18,662, and miscellaneous and undisclosed sources accounted for \$84,155.

While a survey of this type had not been made before, it is believed that this sum represented the largest support of pharmacy from outside sources up to that time. There is evidence that a survey of the current situation would show a material increase. Even so, this is far too small an amount when compared to other professional schools and even single science departments.

A third important constellation of problems revolves around the programs themselves. In the early days of graduate work, there was a distinct tendency to concentrate the course work within the school itself. Schools generally appreciate now the need for strong courses in the basic science areas and competition with non-pharmacy graduate students. The importance of this cannot be overemphasized. Strong graduate courses in mathematics, physical chemistry, physics, chemistry, physiology, bacteriology, and other related sciences are essential, depending on the area of specialization. A great deal of exciting research has made tremendous strides in these more basic fields. Pharmaceutical chemistry, for example, does not exist in a vacuum, and students who are not thoroughly familiar with trends in the advanced theory and practice of organic chemistry with its emphasis on electronic concepts, reaction mechanism, resonance, and the like are not in a favorable position in many phases of pharmaceutical chemical research. So-called pharmaceutical pharmacologists who do not have good backgrounds in anatomy, physiology, pathology, biochemistry, biophysics, and biometrics are simply not adequately trained. By the same token those in pharmacy administration must have advanced courses in economics, marketing, management, etc., to appreciate the nuances of the business side of pharmacy.

The newer area of physical pharmacy has placed the technical side of pharmacy on a good foundation. On the other hand the sociologic side of pharmacy is almost completely neglected. The University of Wisconsin has had a program in the history of pharmacy and history of science for several years and has gradually added work in the Social Studies Division

of the University to meet the needs of individual programs. Regardless of views that we may have on the subject, everything points to the fact that the health professions are becoming more socialized and find themselves every day under more and more social pressure. Self preservation demands that we understand our position in such changing environment and that we have the facts when they are needed. I have the uneasy feeling that this is an area that may be of more importance to our future alumni than doses and chemical structure. This is an area where pharmacy administration can help us, also, if it sets its research sights above the area of day to day pharmacy retail economics up to the realm of the economics of pharmacy's professional position among the health professions.

Related to the program is the question of teacher preparation. A fairly high proportion of our graduate students enter the teaching profession. The training of these students for this special role is almost nonexistent. Many of the students receive their financial support from non-teaching fellowships and, hence, have no opportunity to teach during the period of graduate education. Those who have teaching assistantships are performing a kind of internship function, but unfortunately this is all too often at about the same level as the tobacco counter internship in retail pharmacy practice—almost completely unsupervised and not systematized.

All is not darkness in this area, however. The University of Michigan has a specific course in academic pharmacy for graduate students and other colleges have sought to formalize instruction in this area by one means or another.

The Committee of Fifteen, established by the Fund for the Advancement of Education has this to say about the relationship between graduate instruction and teaching:

1. Graduate schools, in their efforts to advance the boundaries of knowledge by research, are at present not paying sufficient attention to a function that they inherited by a natural historical process—that of providing effective training for college and high school teaching;
2. Since the tidal wave of students expected to flood our colleges in the near future will enforce a change of some kind, it is the responsibility of the graduate schools to see to it that this change will not create a chaos in which scholarship and scholarly teaching will have become a mere memory.
3. If scholarly teaching is to survive in our colleges—and we believe that non-scholarly teaching simply isn't teaching—it should become the avowed purpose of graduate education to produce more people who are neither mere scholars nor unscholarly teachers but scholar-teachers.

The Committee goes on to say that:

The inadequacy of graduate study as a preparation for teaching has arisen, we believe, from

1. The false assumption that *every* Ph.D. candidate is both potentially and by inclination one of those future high priests of learning whose lives will be devoted exclusively to the advancement of knowledge;
2. The failure to realize that, to the college teacher by *vocation*, even the most exacting research is primarily a way of preserving and increasing the vitality of his teaching and the intensity of his intellectual life.
3. The failure to create Ph.D. programs sufficiently meaningful to serve the interests of both groups. . . .

Close analysis always reveals the artificiality of the alleged conflict between "teaching" and "research." Our Committee regards "learning" and "teaching," or "research" and "publication" as two phases of one activity; the life of the mind.

There are not scholars and teachers, but gradations and mixtures of ability in research and in the mode of communicating its results. Every good teacher must be trained in his discipline and keep up with its literature. Otherwise he is no teacher but a drill master coasting on his memory of early learning days. And every good scholar owes it to himself and his institution to share his acquirements, old and new. A man who can do no research and think is in no borrowed sense a productive scholar if he "publishes" his results annually by word of mouth to a group of students. The chances are that the "latest scholarship" is thereby communicated more widely—even perhaps more fully and intelligibly—than if he relied on the uncertain device of distributing reprints. Indeed, our confidence in the magic of print might well be tested by a detailed study of how soon, how well, and how widely the contents of those "little articles" are known upon which we base our estimates of scholarly powers. . . .

In discussions of the problems encountered in training college teachers, it is frequently assumed that there exists a sharp dichotomy between the good scholar and the good teacher, and that effectiveness in teaching is therefore incompatible with productive scholarship. Sometimes it is said the "typical research man has neither the interest nor the personality to teach any but advanced students in his own field," and that on the other hand, "successful undergraduate teachers have neither the interest nor the capacity to do outstanding research."

In the opinion of our group, the dichotomy so frequently and categorically assumed to exist between the good scholar and the good teacher is false. All good teaching, we believe, is scholarly teaching; and though one cannot logically reverse this proposition and maintain that all scholarly teaching is *ipso facto* good teaching, it still remains true that non-scholarly teaching is not good teaching. . . .

It may be still acceptable to define *Wissenschaft* as the sum total of knowledge plus the techniques of discovering new knowledge. But if philosophical criteria to distinguish significant from insignificant facts are no longer available, or conveniently forgotten; if, above all, knowledge that is fresh, active, and of immediate import and concern to the knower is no longer distinguished from knowledge that is dead, inert, and of no possible concern to anybody; if, in short, there is not only a "democracy of subject matters" but also an "equality of individual facts," then research becomes fact-grubbing, and the search for Truth degenerates into a search for dissertation topics.

The next area of graduate problems, as I see it, is the need for self-study. We have had now sufficient experience with graduate work in many of our member colleges that the time has come for a thorough self-study to see where we have been, where we are and where we are going.

The pamphlet *Improving Graduate Education. A Guide to Institutional Self-Evaluation* published in 1951 by the Board of Control for Southern Regional Education is a very helpful guide in this connection. While this guide is intended for the diagnosis and prognosis of an entire institutional graduate program, many of the questions raised are pertinent to pharmaceutical science.

Goals of graduate programs need to be restudied, and more particularly the ways they are met and the degree of success in their attainment. Procedures need restudying in many cases. With respect to the students, there is a need for appraisal of research competence, and other professional competencies, appraisal of ability to teach, appraisal of ability to supervise others and to cooperate professionally, and the appraisal of their professional ethics.

Schools should attempt to learn their strengths and weaknesses from their graduate alumni in a systematic fashion. Research directors and supervisors in the industry and academic employers can give much valuable advice also in assaying present programs and preparing for the future.

In closing, there is no more important phase of pharmaceutical education than the graduate program. The graduate school, in the eloquent words of Jacques Barzun is "the keeper of Scholarship's conscience". It is up to us to keep that conscience sensitive to the responsibilities of the times.

SUGGESTED READING

- (1) Kidd, Charles V., "New Government—University Relationship in Research." *Higher Education*, 16, 3 (April, 1960).
- (2) Gropper, George L. and Robert Fitzpatrick, "Who Goes to Graduate School?", American Institute for Research, Pittsburgh, Penn., 1959.
- (3) "Improving Graduate Education. A Guide to Institutional Self-Evaluation," Board of Control for Southern Regional Education, Atlanta, Ga., 1951.
- (4) Committee of Fifteen, "The Graduate School Today and Tomorrow," Fund for the Advancement of Education, New York, N.Y.
- (5) Ness, Frederic W. (Editor), "A Guide to Graduate Study," Association of American Colleges, Washington, D. C., 1957.
- (6) Harding, Donald W. and Glenn L. Jenkins, "Twenty-five Years of Pharmacy Graduate Work at Purdue," *Am. J. Pharm. Ed.*, 15, 231 (1951).
- (7) Elbers, Gerald W. and Paul Duncan, "The Scientific Revolution, Challenge and Promise," Public Affairs Press, Washington, D.C., 1959.
- (8) Eells, Walter Crosby, "Doctorates from Leading American Graduate Schools, 1861-1958," *School and Society*, 27, 93 (February, 1960).
- (9) "Teacher Supply and Demand in Universities, Colleges and Junior Colleges, 1957-58 and 1958-59," National Education Association, Washington, D.C., 1959.
- (10) Blythe, Rudolph H., "Opportunities for Pharmacists in Industry," *J. A.Ph.A., Pract. Ed.*, 19, 362 (1958). "The Demand for Pharmacy-Trained Ph.D.'s in Industry," *Am. J. Pharm. Ed.*, 21, 354 (1957).
- (11) Green, Melvin W., "Research Activity in Colleges of Pharmacy," *J.A.Ph.A., Pract. Ed.*, 20, 28 (1959). "Progress and Problems in Graduate Instruction in Pharmacy," *Am. J. Pharm. Ed.*, 19, 466 (1955).
- (12) Jaracz, William A., "Trends in Graduate Education," *Higher Education*, 11, 87 (1955).
- (13) Blauch, Lloyd E., "The General Report of the Pharmaceutical Survey," American Council on Education, Washington, D.C., 1950, p. 108.
- (14) "Symposium: Supply and Demand of Ph.D. Pharmacists," *Am. J. Pharm. Ed.*, 21, 34 (1957).
- (15) Lewis, Roy and Angus, Maude, "Professional People in England," Harvard University Press, Cambridge, Mass., 1953.
- (16) Mattingly, Richard C., "Financial Aid for College Students: Graduate," U. S. Dept. Health Education and Welfare, Bulletin No. 17, 1957.
- (17) "Problems and Policies of Graduate Education: A Symposium," *J. Higher Education*, 30, 120 (1959).
- (18) Axelrod, Joseph, "Graduate Study for Future College Teachers," American Council on Education, Washington, D.C., 1959.

RELATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE EDUCATION IN PHARMACY

GLENN L. JENKINS

INTRODUCTION

When Dean Waldon asked me to participate in this seminar he suggested the title, "Integrating Undergraduate and Graduate Education." Integrate means to form into a whole or to round out and to perfect. Basically, any system of extended professional education and graduate education is incompatible. Consequently, I have changed the title to "The Relationships of Undergraduate and Graduate Education in Pharmacy" with the intent of setting forth certain guide lines pertinent to integration.

Probably each school of pharmacy in this country when established had for its objective the education of competent practitioners of the profession of pharmacy with the expectation that the graduates of the school would serve the public directly as licensed pharmacists. As the transition of pharmacy from an art practiced by the individual moved to a technology and science largely carried out in great industrial enterprises through teamwork by specialists, our concept of education for professional competence has necessarily changed. Each of our schools by its original charter or by the charters of the institution with which it is associated has found it possible to broaden the scope of its original objectives to encompass education for all segments of the profession. As a net result the program that started as an integrated undergraduate plan has grown into a diverse program at both the undergraduate and graduate levels. This diversity probably will increase with the rapid rate of increase in knowledge and the demand for specialists in professional practice, in technology, and in our scientific endeavors.

THE TIME ELEMENT

Our higher institutions of education are confronted with a group of closely interrelated and in many ways distinctive problems associated with a need for an expanded strength of education in professional as well as nonprofessional areas. The situation appears to be particularly critical in fields such as medicine, dentistry, pharmacy, engineering, and education. The need exists for new and broadened program offerings as well as for substantially increased numbers of students. One thing is clearly evident, namely, that the demand will far exceed the supply in the immediate future for research-oriented, highly trained academic people to man the faculties of our institutions of higher learning. The problem is almost hopelessly compounded by the additional graduate degrees appropriate to collegiate faculty status. Consequently, all of the professions with extended programs face a dilemma which they are seeking to resolve.

One of my colleagues in the field of engineering has partly summarized the efforts that have been made in that field relative to the five year course which are condensed as follows. At the University of Minnesota, well-

qualified and motivated students may use the fifth year of the five year program to obtain an M.S. degree. At Dartmouth, satisfactory completion of the fifth year in engineering science qualifies the student for an M.S. degree. At the University of Florida, students who take the engineering science program may complete the A.B. plus the M.S. program in five years. At Cornell, no more than fifteen hours of graduate credit may be earned during the five year engineering program. At Ohio State, superior students may elect a program that leads to the M.S. degree in five years. At the Massachusetts Institute of Technology, the B.S. and the M.S. degrees are awarded at the completion of five years to superior students. It is concluded that many five year engineering curricula permit the M.S. degree in addition to the B.S. degree to be earned in five to five and one-half years.

In the field of medicine there is much debate with charge and counter-charge, argument and rebuttal. The need for the promotion of expanded programs of graduate education in medicine is almost universally recognized. Efforts to recruit students for the basic medical sciences from schools of pharmacy and from the areas of biology and chemistry are well known. The extended program of medical education plus the need for graduate education is so time-consuming that faculty strength in the basic medical sciences has tended to decline because of the proportionately less attractive economic opportunities offered and the long period of training required. Thus the entire system of medical education is threatened at its foundations. No extended study of medical efforts to meet this situation is made here. It might be pointed out that Johns Hopkins University has initiated plans to reduce the time period for superior students. Tulane University is reported to be enthusiastic about an effort to proselytize in behalf of academic medicine by joint efforts of the medical and graduate schools to establish a combined M.D.-M.S. four year program which permits graduate credit for some of the basic science work done during the first two years of medicine.

THE UNDERGRADUATE STUDENT

Increasingly, students who enter college from secondary schools, under the impact of the upsurge of science and with improved counseling, are laying plans to continue beyond the baccalaureate degree into graduate work. In general, those who enter the professional schools do so with the ultimate objective of professional practice. Those who expect to go forward for a scientific career tend to enter schools of arts and science to lay the foundation for graduate work. In pharmacy we need to preserve the two pillars of quantity and quality in our system of education. If we can get our share of quality students, we should be able to recruit a substantial number who have the interest, the imagination, and the mental capacity to undertake graduate work. Our schools have made far more progress in identifying the talented individual than in the development of programs for those of different levels of academic ability. We need various kinds of flexibility in our programs to permit sensible experimentation to meet the varying needs of young people. Having identified the superior individual, it should be the aim of our educational system to help that individual to fulfill the promise that is in him. If we are serious about advancing graduate work and helping each individual to develop his poten-

tialities to the utmost, then our educational system in pharmacy has no choice but to provide different treatment for different levels of ability. Our academic system must permit the academically talented youth to dig deeper, travel faster, enjoy the challenge of unusually difficult tasks, and explore the full range of his own intellectual abilities.

The time period of the undergraduate curriculum in pharmacy is incompatible with the recruiting of talented youth for graduate work. When I described the minimum time requirements as established in pharmacy to a colleague in education, he remarked, "Pharmacy is still in the horse and buggy days of education." President Kirk of Columbia University has said that even our four year curricula in colleges are geared to the seventeenth century. Undoubtedly one of the most insistent problems in higher education today is the necessity to reduce the time spent in preparation for careers. Probably the most logical method of achieving the desired result is through the differential treatment of the academically talented through acceleration. Acceleration got a bad reputation during the war years, but there are various forms of acceleration. For example, there is the advanced placement program under which high school seniors take college level courses in their high schools and receive college credit for them. At the present time more than 11,000 students have advanced standing in 391 colleges. The trimester plan should be available to those who know where they are going and want to get there. The advantages of the four quarter or trimester plan saving one year may be a limited advantage, but the over-all benefits are far-reaching when they are translated into better motivation for students and increased use of facilities.

In the absence of an accelerated program some progress can be made even in the five year program by establishing a scientific option where the interested and qualified student may lay the groundwork for graduate education. This option would require teaching at different levels and in a manner to challenge the student. It would remove those of superior ability from courses taught at the median and below median level. Exceptional students can carry an overload above that of the median student in amounts of three to five credit hours just as logically as some students can do high quality work while engaged in outside employment. These and other means to stimulate the superior student and challenge his capacity should be open to those schools that have the facilities, the staff, and the means to bring them into sound practice. We must abandon the lock step system which places the student of superior talent in the same squad and traveling at the same pace as the slowest members of his class.

THE FACULTY

Undergraduate professional teaching and graduate education with faculty research have many elements of incompatibility. Today research is so generally accepted as one of the great natural functions of our institutions of higher learning that it is difficult to realize that for centuries universities were just places where teachers taught students. Teaching started to move over to make room for research about 1900 and thereafter. With the upsurge of science the majority if not all of our teachers in professional and scientific areas are now expected to participate in and guide research. It

would be ridiculous to claim that the research function did not compete with the teaching function. It has been said of several great scientists that when asked how they managed to do so much good research, they replied, "by neglecting my teaching". Irrespective of the origin of this story, it has considerable truth in its message.

As teaching has been moved farther and farther aside to make room for research, many educators and scientists who believe strongly in both activities have tried to play down the mutual interference effects. Often we have closed our eyes to them. This Association and our accrediting agency have placed great emphasis upon faculty research in the hope that it would upgrade instruction in the professional program. This coexistentialist doctrine is based on three ideas, namely: 1. Every good research man is a superior teacher; 2. It is not possible for a superior teacher to be a non-research man; 3. A union between the instructional and research activities of faculty members is always mutually beneficial.

I do not believe that these propositions were inductions from real observations; rather, they were just articles of faith and hope. They are wishful thinking in an effort to deal with a real problem which is still unsolved: the problem of promoting the mutually helpful coexistence of instruction and investigation in science. It is not suggested that there is a negative correlation between effective teaching and research, but only that positive correlation is often lacking. The claim that a faculty member not doing research or not eager to do research can never be a superior teacher holds that one never really understands the complex phenomena, the treachery of plausible explanations, and never grasps the reasons behind the reasons until he digs clear to the bottom of extant knowledge and then a little deeper. This argument additionally holds that although book learning is fine, research workers are doers of the word who have buried themselves in the complex mysteries and drawn out the truth with their own efforts. However, life is short, science is long, teaching is broad, and research is narrow and demanding. There is not time for anyone to master the whole of a complex area through direct research experience. The detailed insight that a man has time to secure through research will rarely be passed on to his students except in a seminar in his specialty or by an egotist boring his class. Intensive research demands high specialization, but good teachers need broad, scholarly perspective.

One danger when graduate work and research are unduly emphasized is that members of the faculty often view teaching as a comparatively minor and peripheral part of a faculty member's university activity. Some faculty members become interested solely in graduate work and research and lose their interest in undergraduate teaching and consequently do a poor job of it.

In the operation of a university department the interests of teaching and research are competitors. They compete for the working time of the staff members, for room space, for funds, and for the control of faculty appointments.

Within each school the most important force for scholarly motivation is the teacher. The first requirement is that the teacher himself place

a high value on intellectual achievement. If he has a zeal for teaching and a genuine respect for excellence, he will accomplish more to advance the cause of pharmaceutical science than by performing research. One of the most important things that teachers can do to motivate the academically talented student is to help him understand his own potentialities.

Most of us have been graduate students and can remember sitting before at least one honored research scientist who for one reason or another was unsuccessful in the class room. Possibly he did not care for people, or he was just naturally inarticulate. It may be that he was bored with teaching and considered it an unimportant part of a job that he had accepted mainly to be able to do his research. Regrettably, examples of this kind are too numerous.

It is easy to point out that the association of instruction and research necessarily benefits both. It is research that gives the teacher something to teach, and without the teacher's support research would die for the lack of trained workers. Beyond this broad interdependence individuals have found the combination advantageous, and some have found it possible to do high quality research as well as competent teaching. If a personal reference will be pardoned, it has been my experience that the demands of research and teaching have been in conflict for nearly forty years, and I cannot remember that either function ever greatly helped the other. Many a class presentation would have been better prepared and many a student better served if the urgency of some research situation (and the fascination of it) had not demanded attention. The continuous concentration that a research problem demands has often been broken up by the class bell. This is not a situation in which I take particular pride, but it is just one of the facts of academic life.

Near the end of the nineteenth century the eminent presidents, such as Eliot of Harvard, White of Cornell, and Gilman of Hopkins, declared that in the faculties the teaching function was more important than investigation. A generation later President Harper of Chicago University announced in effect that the promotion of faculty members would depend more largely upon the results of their work as investigators than upon the efficiency of their teaching. This constituted a wide open invitation to the faculty to neglect their students in favor of research. The Harper policy, namely supremacy of research, is now in effect in nearly all of our institutions of higher learning, although in most of them the statement is made that teaching and research are treated as equals. Too often, the number of publications from a faculty member or a school are used as criteria with little regard for quality. In other areas of competition I illustrate only by the fact that in some departments the financial support for a research project sometimes greatly exceeds the total funds available for the teaching function. I have treated the incompatibility between undergraduate and graduate instruction from the standpoint of the faculty at length because I believe it is exceedingly important, poorly understood, difficult to manage, and a threat to superior instruction in a professional school. Scholarly teaching and sound research must be kept in balance and advanced in accordance with the resources of each school.

GRADUATE STUDENTS

There is an incompatibility between the extended program of professional education and the recruitment of well-qualified graduate students. The proportion of students who elect to enter graduate work from such areas as biology, chemistry, and physics from the arts and sciences departments greatly exceeds the proportion who enter into graduate work after completing the requirements of a professional school. To meet this situation our graduate areas in pharmacy are recruiting graduate students from the non-pharmaceutical areas and without a pharmaceutical background. In other words, they are recruiting qualified students who have the four year Bachelor of Science degree. It should be emphasized that it is a student's background knowledge of pharmacy that makes him pharmaceutical, and without this background knowledge we can never evolve basic pharmaceutical sciences. For example, a student with a B.S. in chemistry who enters graduate work in pharmaceutical chemistry and undertakes a synthetic problem may become what is known as a competent medicinal chemist. He will not have allegiance to the profession of pharmacy, and he will not declare himself to be a pharmaceutical chemist, but rather he will call himself an organic chemist. In the long range view he will not bring advancement and prestige to our profession and promote its eminence in science.

Since the use of graduate students as teaching assistants is a well-established practice and will grow as the demands of our instructional programs expand, we have a real opportunity to integrate undergraduate and graduate instruction. Practically all graduate students, even though they enter industry and research after completing their advanced degree, engage in a teaching function in handling people, instructing subordinates, presenting seminars, and in other ways. So long as we treat our teaching assistants as laboratory instructors who serve as proctors to keep order in the room, our program will be deficient. We need to adopt a program along the lines set forth at the Teachers' Seminar on Pharmacy in 1955. In this way we can upgrade our undergraduate professional instruction. Appointments to graduate teaching assistantships should be reserved for graduate students who really want to learn about college level teaching; not only must the assistant be interested, but he must be carefully supervised. Our laboratories should be the place where the student and teacher become acquainted and where the teacher can dispense his knowledge at first hand and on an individual basis. The increasing practice in some colleges of using undergraduate students as teachers in the hope of recruiting them for graduate work and for research is an unwarranted exploitation of the undergraduate student being taught and often of the undergraduate assistant on a low level stipend.

PHYSICAL FACILITIES

The planning and use of physical plant and equipment present problems in integration. Professional education thrives best in a unitized system where the faculty offices, the laboratories, the equipment, and the research space for any given area of instruction form a compact unit. A unit of this kind permits the maintenance of an opendoor policy where the faculty is always

available to the student. It creates a climate where scholarly work is in progress and the undergraduate student at least observes research in progress and is stimulated to consider the possibilities of a research career. The more closely the professional and graduate work are intermingled in a physical sense, the better the environment for scholarly achievement. On the other hand, separate research wings or buildings and research laboratories far removed from the professional instructional areas tend to separate the professor from his students and remove equipment from the view of the undergraduate sometimes to the point where the undergraduate student does not realize that research work is in progress.

A major problem in physical plant integration is the protection of the professional areas of instruction from continued encroachment by the graduate or research area. As new projects are established and space is demanded, as new equipment is required for research, there is a tendency to take from the undergraduate instruction support in terms of space, equipment, and funds in order to provide for the graduate and research areas. The integrated system is definitely superior here, since often the specialized equipment can be used for demonstration and personalized instruction to the professional student.

ADMINISTRATION

If we accept the viewpoint that the prime function of a college of pharmacy is to prepare professionals for competency in practice and service to our citizens, it becomes obvious that wise administration is required to prevent encroachment on the professional instruction by research. A part of this protection involves the recognition of good teaching as a prime basis for promotion of faculty, the utilization of space and equipment in a manner to give full force to the best instructional procedures, and the devotion of time by the highest level members of the faculty to the problems and work of professional instruction. Good administration requires recognition of the fact that some faculty members are excellent teachers and poor research workers, and that some are excellent research workers and poor teachers. Good results can be obtained when a spirit of teamwork is instilled into the staff so that the highest level research worker participates in some instruction, and the highest level teacher sits in on the planning and execution of certain research projects. It is just as important to discover talent among good teachers and research workers as it is among students. Once such talent is discovered, it must be rewarded. In a school of pharmacy where we spend our lives in an atmosphere of collaborative effort, a major problem is to give expression to creativity by the individual within the institutional atmosphere. It is axiomatic that any institution can be no more purposeful or creative than the individuals who endow it with purpose and creativity.

SUMMARY

The relationship between undergraduate instruction in an extended system of professional education and graduate education can only be partially integrated in terms of students, instruction, facilities, and administration. There are more areas of competition and conflict than there are areas of mutual strength.

Any extended system of professional education constitutes a barrier in terms of time against the talented youth whom we seek for graduate education. The time barrier system adopted in pharmacy through the American Association of Colleges of Pharmacy and our accrediting agency constitutes our greatest obstacle to progress at the advanced level. There should be no artificial barriers that prevent a superior student from realizing the maximum of his potential. Financial obstacles are rapidly being leveled by loans and scholarships. The one remaining hindrance is the time factor. This is an anachronism in a jet-propelled age.

Our schools cannot do full justice to each young person in developing what gifts he may possess until they face frankly the need to provide different programs for different types and levels of ability. Our schools have made more progress in identifying different levels of talent than in the development of programs for these different levels. Adequate attention to individual differences means sensible experimentation with various kinds of flexibility in the curriculum to meet the varying needs of young people. Especially it means providing unusually able youth with rigorous and challenging experiences.

Pharmacy is not medicine, and the sooner we cease to ape its pattern of training and education the better off we will be. The hope of pharmacy to create a science of its own rests squarely upon the foundations of the sciences of chemistry, biology, and physics and not on a clinical practice.

A system of education that requires us to recruit our graduate students from non-pharmaceutical areas can only weaken our ultimate objective to build pharmacy into a great profession and a true scientific discipline.

Research is important but not so important as teaching. We will prosper most if our research is primarily a teaching function—the training of men to do research.

CONCLUSIONS

The greatest threat to our educational progress is the time required by superior students to obtain a degree. The most logical plan to accomplish our educational advancement requires a recasting of our total program to provide for: 1. an integrated four year undergraduate course of liberal and professional education with opportunity for acceleration by the talented leading to the baccalaureate degree and patterned pretty much along the lines followed by chemistry, biology, and physics; 2. a period of specialization for those who want to enter general or professional practice and require one or more years for a professional degree and licensure to practice; 3. the admission to graduate work of qualified and talented graduates with the baccalaureate degree and who are motivated to enter such fields as education, technology, and research.

Any program that is worked out should be flexible and so designed as to take advantage of the strength and avoid the weaknesses in each individual institution. We can demand certain minimum standards on a uniform basis, but rigidification as now required can lead only to common mediocrity.

EVALUATION AND PROJECTION OF THE TEACHERS' SEMINARS

THE EFFECT OF THE TEACHERS' SEMINARS ON UNDERGRADUATE TEACHING

JOSEPH B. SPROWLS

Since their inception in 1949, the Teachers' Seminars on Undergraduate Teaching have completed two full cycles. The seminars which have thus far been completed include the Pharmacy Teachers' Seminars, 1949, 1955; Pharmacy Administration Teachers' Seminars, 1950, 1956; Pharmacology Teachers' Seminars, 1951, 1957; Pharmaceutical Chemistry Teachers' Seminars, 1952, 1958; Pharmacognosy Teachers' Seminars, 1953, 1959; and the Pharmaceutical Education Seminar, 1954.

Commentaries have appeared regarding individual seminars in the series and opinions have been solicited during the planning stage of each seminar, but no attempt has been made to obtain a broad evaluation of the influence these programs may have had on pharmaceutical education over the years which have elapsed. When I was called upon to present a paper, it was decided to make such an evaluation as best could be done with the limited time, facilities, and finances available to me.

The procedure utilized was as follows: Senior pharmacy students at Temple University were engaged for the purpose of reviewing seminar reports available in the library, and for their technical assistance I am greatly indebted! Since all of those students* who cooperated are intending to continue studies at a graduate school, it is hoped that they received inspiration and insight which may be of value to them in future years.

Selected items from the summaries were used in the preparation of questionnaires which were circulated to those teachers who had attended at least one seminar and who are listed in the roster of teachers for 1958-59 as published by the American Association of Colleges of Pharmacy. Replies from teachers were prompt and generally complete, and sincere appreciation is expressed to all who supplied information for use in the presentation of this paper.

Because individual seminars varied greatly both in organization and in content, the questionnaires were not of a uniform nature. Varied approaches were used with deliberation, in the hope that operational efforts might be detected through comparison of results. No attempt was made to determine the value of the general educational seminar held at the University of Connecticut in 1954, because it was felt that the measures would have to be very broad and thus have little reliability. At first, it was believed that a survey of pharmacognosy teachers would have little validity because of the intervention of Annual Plant Science Seminars. Upon the urging of teachers from this field, it was decided to conduct a survey dealing with the difference in the influence which the Plant Science Seminars and the Pharmacognosy Teachers' Seminars have had upon teaching in the area of the plant sciences.

* Barbara Segal, Leon Levin, Allan Isenberg, and Robert Capizzi.

A complete summary of data collected from the questionnaires will be presented in the appendix to this paper; however, in the paragraphs to follow, some of the most important data will be summarized and discussed.

PHARMACY TEACHERS' SEMINAR

This survey was mailed to fifty teachers of whom forty-four responded in time for an analysis to be included.

Among the subjects discussed at the Pharmacy Teachers' Seminar of 1949 was the value of courses such as Pharmacy Orientation, History of Pharmacy, and Physical Pharmacy. An attempt has been made through this survey to determine if recommendations of the 1949 Seminar have influenced the adoption of courses by colleges of pharmacy. Of the forty-four schools replying, thirty-nine offer a course in orientation and although five do not, three of these will include it in the five year curriculum. Of the thirty-nine offering the course, twenty-six have added it since 1948*; whereas, thirteen were offering such instruction at the time of the seminar. Thirty schools offer a course in History of Pharmacy, although only seven have added it since 1948 and an equal number have deleted it.

Twenty-three schools now offer a course in Physical Pharmacy and thirteen schools plan to include it in their five year curriculum. (Total of thirty-nine). Only two schools offered such a course as early as 1948, while twenty-one have added it since that time. When teachers were requested to indicate special values which they had received from the seminars, a number indicated that they had been influenced to adopt instruction in Physical Pharmacy. It should be noted that the seminar of 1955 also placed considerable emphasis upon this course. One may conclude that the Pharmacy Teachers' Seminars influenced course adoptions in Orientation in Pharmacy and Physical Pharmacy, perhaps because such courses fill a definite need in the instructional pattern.

Replies indicate that there is close agreement with the 1955 Seminar suggestions regarding course content of Pharmacy Orientation, with one exception: Only twelve schools presently include the subject of Fair Trade in their course.

Courses in the history of pharmacy are not new and their value is subject to considerable variation in interpretation; consequently, it is not surprising to find no notable change in offerings as a result of the seminar discussions of the subject. The adoption of elective courses may have been stimulated, because a considerable number of schools have adopted suggested electives since 1948.

Speakers at the 1955 seminar emphasized the value of teaching incompatibilities by using an approach based upon electronic theories. Questionnaires indicate that forty departments teach the subject in this way, although thirty indicate that they were not influenced in their choice by seminar attendance. Nine respondents state they were so influenced and one says perhaps. One might conclude that seminar speakers did not establish a new trend of thought but emphasized a previously recognized pattern of teaching. Seminar speakers also indicated that the course in organic medicinal products should particularly emphasize physical and chemical properties of drugs (as opposed to pharmacology or methods of synthesis). While the majority of departments indicate such an emphasis, only five believe they have been influenced by the seminars, and four indicate they have not.

* It was assumed that the earliest adoptions might have been in the fall of 1949.

PHARMACY ADMINISTRATION TEACHERS' SEMINAR

Information is based upon thirty-five returned questionnaires of the forty which were mailed. Questions were based mainly upon the seminar of 1950. Because the form was prepared after the Pharmacy survey had been completed, a number of changes were made in the format.

The seminar of 1950 emphasized the importance of administering a course in principles of economics as background for pharmacy administration subjects. Replies indicate that twenty-three schools offer such a sequence with an additional four planning to do so in the near future. Eight schools have added "Principles of Economics" since 1950, and of these, six schools were influenced by the seminar. Fifteen semester hours of instruction in administration were agreed upon as minimal by the seminar of 1956. Fourteen of the schools surveyed offer this amount of instruction at the present time and fourteen more plan to meet the requirement in the near future. Fourteen indicate the increase in instruction as being due to seminar influence. Twenty-seven schools report that the role of the pharmacy administration department is explained to undergraduate students early in the curriculum and nine schools attribute this to the stimulus of the seminar (the seminar of 1956), while sixteen felt that the seminar had no influence. Faculties are in agreement with a seminar recommendation that pharmacy administration courses be taught by a member of the professional staff. Fifteen departments indicate this to be their arrangement, five utilize the staff of the business school, and ten utilize both. Eleven indicate their arrangement has been influenced by seminar discussions, while fifteen have not been so influenced.

PHARMACOLOGY TEACHERS' SEMINAR

A total of forty questionnaires were mailed and of those thirty-nine were returned.

In preparing the pharmacology teachers' questionnaire, it was difficult to propose questions which would measure values adaptable to quantitative expression. More attention has been given to methods of teaching and course content at the pharmacology teachers seminars than at any of the others, save those dealing with general educational methods. Nevertheless, an "ideal" sequence of biology courses was agreed upon at the 1950 seminar. Current curriculums were surveyed to determine the degree of conformity of present patterns with the "ideal."

Only the two California schools which offer six year curriculums were able to substantially meet the requirements of the ideal pattern. Only five schools meet the recommended eight hours in zoology, as opposed to thirty-two which do not. Five schools offer a separate course in pathology, and seven have courses in anatomy and histology which are substantially equivalent to the recommended course. Twenty-seven schools offer, within two hours, the suggested six semester hours of pharmacognosy; three offer as little as three semester hours and seven offer more than eight semester hours. All schools reporting offer at least six semester hours of pharmacology, although fourteen of them exceed this recommended amount by at least two semester hours.

Twenty-four schools have made changes in biology courses since 1951. Major changes reported are increased emphasis on physiology (six), addition of courses in biochemistry (five), and addition of courses in comparative

anatomy (five). When asked if these changes resulted from the influence of the seminars, twenty-one schools responded negatively, seven positively, and three replied partially.

PHARMACEUTICAL CHEMISTRY TEACHERS' SEMINAR

There were fifty-two questionnaires returned of sixty-seven mailed.

The survey of pharmaceutical chemistry teachers afforded an opportunity to evaluate the effect of the teachers' seminars on teaching methods and course arrangement. The seminar of 1952 recommended that the course in organic medicinal products utilize a pharmacologic or therapeutic classification as opposed to a strictly chemical classification. Questionnaires from respondents indicate that thirteen use a pharmacologic classification, six a chemical classification, and thirty-three use both. Within the latter group, opinions are equally divided as to whether the preferred emphasis should be chemical or pharmacologic. When asked if their choice of classifications was influenced by the teachers' seminar, thirty-eight reported in the negative and fourteen in the positive.

A suggestion from the 1952 seminar for frequent meetings between chemistry and pharmacy departments has found good acceptance. Thirty-five report that such meetings are held regularly, while sixteen report they are not. Twenty-four report that interdepartmental meetings have been stimulated by the seminars; ten report seminars have not influenced this decision.

A speaker at the 1952 seminar urged the incorporation of drug analysis and quantitative analysis into a single course. This suggestion was apparently unacceptable to departments of pharmaceutical chemistry; for only six schools offer such a combined course, whereas forty-five offer separate courses. Two report the adoption of a combined course since 1952. It is notable in this regard that a speaker at the 1958 seminar emphasized the importance of separate courses.

A suggestion that students assay preparations manufactured in pharmacy courses has found moderate acceptance. Nineteen schools report that such a plan is operative as opposed to thirty-four in which it is not. Twelve of the nineteen report that the system was adopted as a result of seminar recommendation.

Courses in instrumental methods of analysis and radioisotopes have found wide acceptance, though it is difficult to know whether these adoptions have been stimulated by the seminars. Forty-four schools report either required or elective undergraduate courses in instrumentation as being available while thirty-five report such graduate courses. Sixteen report the institution of such courses since 1952. Thirteen have instituted undergraduate courses in radioisotopes and twenty have such offerings at the graduate level. An additional fourteen plan such instruction for the near future at some level. Only three report that the seminar discussions have helped to stimulate such course adoptions, while nineteen report that the seminars had no influence. It would appear that in this case, as in many others, seminar discussions emphasized accepted trends rather than established new ones.

PHARMACOGNOSY TEACHERS' SEMINAR

Since the proceedings and registration list from the 1959 Pharmacognosy Teachers' Seminar were not available, this survey was based upon the proceed-

ings of the seminar of 1953. Thirty questionnaires were mailed out and twenty-five were returned in time to be summarized.

All but one of the respondents attended at least one Plant Science Seminar during the past decade. Twenty-two of the teachers believe the Teachers' Seminars have influenced their undergraduate teaching and, of these, nineteen were able to distinguish the influence of the Plant Science Seminar from the influence of the Teachers' Seminars. Two have no opinion, and one cannot distinguish the influence of the two meetings. Other questionnaire responses had suggested that seminars in general education might have been more helpful than specific seminars. Consequently, pharmacognosy teachers were asked to compare these values. Of the twenty teachers who attended both types of seminars, only three noted that the contribution of the general seminars was greater; whereas, thirteen felt that it was not, and three had no opinion. Since 1952-53, nine schools have changed the number of credits offered for pharmacognosy; of these, four have reduced the number of credits and an equal number have made an increase. Reasons for reducing the number of credits are deletion of obsolete material and removal of subject matter to the course in pharmacology.

It was recommended at the 1953 seminar that the biochemical or physiological classification be used in the course in pharmacognosy instead of the classical taxonomic classification. Survey answers indicate that twelve schools presently use the biochemical approach; two, the physiological approach and four the taxonomic. No attempt was made to determine whether the Teachers' Seminars have influenced this trend.

GENERAL OBSERVATIONS

In all questionnaires, an opportunity was provided for teachers to express general values derived from the seminars. Although uniform terminology was not used, the nature of replies permitted grouping under general categories in accordance with the following table:

| Values | Number of responses |
|---|---------------------|
| Exchange of ideas and information | 59 |
| Suggestions for improvement of teaching methods | 24 |
| Suggestions for curriculum revision | 13 |
| Comparison of methods with others | 16 |
| Evaluation of methods presently used | 16 |

In the pharmacognosy questionnaire, a check list of these major values was provided and results were consistent with the above, as will be shown by the following tabulation:

| Values | Number of responses |
|--|---------------------|
| Valuable exchange of information with other teachers | 23 |
| Suggestions for changes in course content | 16 |
| Improvement of teaching methods | 18 |
| Justification for methods now in use | 11 |

SUMMARY

It has been possible through questionnaire methodology to measure general and specific values which have accrued as a result of the Teachers' Seminars on Undergraduate Education. Teacher Seminars were not originally intended

to serve as discussion forums of the curriculum or its planning; nevertheless, curricular changes have occurred as a result of seminar influence. In the pharmacy area, it seems rather clear that the widespread adoptions of courses in physical pharmacy and orientation in pharmacy have resulted from the stimulus of the Pharmacy Teachers' Seminars. In the area of pharmacy administration, adoptions of the courses in principles of economics have been encouraged. An increase in the amount of instruction offered in pharmacy administration subjects is another positive result.

Not all seminar recommendations have found acceptance. A recommendation that courses in drug analysis be combined with quantitative analysis met with little acceptance as did proposals for extension of the course in zoology and addition of courses in pathology and anatomy.

Seminars have served to underline trends of instruction which were already apparent. In such instances, the influence of the seminar has been beneficial, since it served to confirm trends of thought and encourage unification of action in course adoptions. Some of the instances in which trends were recognized are the following: emphasis upon combination of qualitative analysis and general chemistry as a single course in the chemistry sequence, encouragement of course adoptions in instrumental analysis and radioisotopes, and emphasis upon increased instruction (particularly laboratory) in physiology and biochemistry.

The greatest value of the seminars may be expressed in terms of personal value to teachers. These have been previously categorized and will not be detailed here. Suffice it to say that faculty members who have attended one or more seminars feel that they have benefited through self-improvement, self-appreciation, or a gain in self-confidence in their teaching methods. Social values are incidental to the major purpose, but it is unquestionably true that the Teachers' Seminars have made a substantial contribution to pharmaceutical education by bringing together faculty members from many schools under conditions which are conducive to exchange of personal experiences and philosophies.

No attempt was made to measure the degree to which attendance at seminars has influenced the careers of teachers. It is a fact that the attendance list of any of the early seminars will include the names of many who have made notable progress since that time. Unfortunately, it is difficult to determine whether seminar attendance stimulated these young people upward in their academic climb. Be that as it may, the seminars have afforded deans the opportunity to meet promising young faculty members and have permitted graduate students and young instructors to investigate more seriously an area of teaching in which they may be interested.

In conclusion, the author suggests an extensive survey to determine the achievements and failures of the teacher's seminars. This small venture proved to be interesting and enlightening, but a great deal more could be accomplished. It is believed that with adequate planning and more time for completion, such a survey would be highly beneficial to those who plan for the future. In the meantime, the information contained in this report should offer much encouragement to those who were responsible for sponsoring and planning the progress of the past twelve years.

ADDENDUM

Brief Summaries of Questionnaire Replies

Pharmacy Teachers' Seminar (fifty forms mailed and forty-four returned).

Thirty-nine include pharmacy orientation and five do not; twenty-six initiated since 1948 and thirteen were not. Three will add orientation in five year curriculum and two will not.

Subjects in orientation courses include: survey of pharmacy literature (thirty-three); survey of pharmacy curriculum (thirty-six); how to study (twenty-six); opportunities in pharmacy (thirty-nine); survey of pharmacy laws (nineteen); and fair trade discussions (twelve).

All require college algebra (five since 1948), inorganic chemistry, organic chemistry, and analytical chemistry. Forty-one require college physics (three since 1948); forty trigonometry (seven since 1948); six calculus (three since 1948); and five physical chemistry (four since 1948).

Elective courses follow: nineteen offer special problems in dispensing (ten since 1948); thirty-five offer hospital pharmacy (nineteen since 1948); twenty-five offer manufacturing pharmacy (seventeen since 1948); eighteen offer veterinary pharmacy (seven since 1948); and twenty-one offer cosmetics (seven since 1948).

In pharmacy incompatibility courses, forty use physical chemical approach and nine of these express seminar influence in adoption of method. Twenty-three teach physical pharmacy (twenty-one since 1950) and thirteen will include in five year program. Thirty teach history of pharmacy (seven since 1948) and seven have dropped same since then. Twenty-two chemistry departments teach "organic medicinal products" as do twenty pharmacy departments. In teaching organic medicinal products twelve emphasize pharmacology, twenty-nine physical and chemical properties and twelve organic synthesis.

Pharmacy Administration Teachers' Seminar (forty forms mailed and thirty-five returned).

Twenty-three include a basic course of economics (eight since 1950) and seven do not. Six adoptions influenced by seminar. Four will add such course in five year curriculum (all influenced by seminar). Pharmacy administration taught by pharmacy staff (fifteen); business schools (five); both (ten). Eleven influenced in arrangements by seminar and fifteen not.

Fourteen offer fifteen semester courses and fourteen will increase instruction in future. Fourteen influenced to increase by seminar; five not; and two partially. Twenty-seven explain pharmacy administration department role to students and nine because of seminar recommendation, sixteen not, and one does not know.

Pharmacology Teachers' Seminar (forty forms mailed and thirty-nine returned).

Schools asked to compare curriculum with ideal biology sequence. Offerings within two semester hours of "ideal" were regarded as substantially equivalent. The ideal follows: Botany (four semester hours) thirty-six par, one under; zoology (eight semester hours) five par, thirty-two under; pharmacognosy (six semester hours) twenty-seven par, three under, seven

over; anatomy and histology (six semester hours) seven par, thirty under; physiology (six semester hours) thirty-one par, four under, one over; biochemistry (six semester hours) twenty-five par, thirteen under; microbiology (six semester hours) twenty-nine par, five under; pathology (four semester hours) five par, thirty-three under; pharmacology (six semester hours) twenty-three par, zero under, fourteen over.

Changes since 1951 include addition of biochemistry (five), addition of comparative anatomy (five), increased physiology emphasis (six); increased pharmacology emphasis (four), no major changes twelve. Changes influenced by seminar (seven) yes, (twenty-one) no, (three) partly.

Pharmaceutical Chemistry Teachers' Seminar (sixty-seven forms mailed and fifty-two returned).

Classifications used for Organic Medicinal Products course include: chemical (six), pharmacologic (thirteen), both (thirty-three). Of those using both, thirteen prefer chemical and thirteen prefer pharmacologic. Of chosen classification, fourteen were seminar influenced.

Departments of pharmaceutical chemistry and pharmacology meet regularly (thirty-five). These meetings influenced by seminar (thirty-five).

Separate courses in quantitative and drug analysis (forty-five). Combined course since 1952 (two). Student analysis of samples prepared in pharmacy laboratory courses (nineteen); adoptions since seminar recommendation (twelve). Courses in instrumentation (forty-four); since 1952 (twenty-two). Graduate instrumentation courses (thirty-five). Instructions in radioisotopes, undergraduate (fourteen), graduate (two). Future radioisotope courses planned (fourteen); adoptions stimulated by seminar recommendations (three).

Qualitative analysis combined with general chemistry (thirty-eight); instituted since 1952 (twelve). Position of organic medicinals in five-year course: precedes pharmacology (twenty-four), follows pharmacology (three), simultaneous with pharmacology (sixteen), partly simultaneous (seven). Course offered in forensic chemistry (five).

Pharmacology Teachers' Seminar (thirty forms mailed and twenty-four returned).

Attended at least one teachers' seminar (twenty-four), attended a Plant Science Seminar (twenty-three). Teaching influenced by Teachers' Seminars (twenty-three). Able to distinguish influence of Teachers' Seminar and Plant Science Seminar (twenty).

Benefits from Teachers' Seminar: valuable exchange of information (twenty-two); changes in course content (fifteen); change in course sequence (three); changes in course credit (two); improvement of teaching methods (seventeen); justification of methods now used (ten). Attended seminar on general education (nineteen). Greatest contribution from general seminar as opposed to others: yes (three), no (thirteen), no opinion (two).

Changes in pharmacognosy course credit since first seminar: reduction (four), increase (four), no change (fifteen). Approaches used in teaching pharmacognosy: taxonomic (three), biochemical (twelve), physiological (two), therapeutic (two), combinations of preceding (four)

SUMMARY OF THE SEMINAR AND RECOMMENDATIONS FOR THE FUTURE

CHARLES W. BLIVEN

HORIZONS IN PHARMACEUTICAL EDUCATION

The thoughts expressed by Dr. George Webster in his paper "Horizons in Pharmaceutical Education" set the stage for the seminar program. He reviewed the changes which have occurred in our educational programs during the existence of our four year curriculum. The value of the guidelines, the early *Pharmaceutical Syllabus* and the Pharmaceutical Survey, were presented. The improvement in our four year curriculums as called for in the Survey was acknowledged and the improvement in quality and variety of offerings was delineated. The most apparent changes cited included the increased offerings in the area of zoology and physiology which culminated in the course in pharmacology.

The improvement in the "business of pharmacy" courses—pharmacy administration—is a most outstanding change. The need for knowledge in this area is essential not only for the practice of sound business principles but also for the initiation of the most effective distributive processes of our drugs under an increasingly competitive economic system.

The demands of present day pharmaceutical technology have necessitated the application of the principles of physical chemistry to our increasingly complex pharmaceutical systems. In our time-honored discipline of pharmacy, the need for the application of the knowledge gained from the basic sciences, including physical chemistry, has been recognized and has resulted in the introduction of the work in physical pharmacy. This new source of knowledge aids in solving the problems of stability and shelf-life and will find increased emphasis in the expanded curriculums.

The growth of graduate education has been most amazing and without this "gibberellic-growth" our total educational programs would not have shown the improvement we enjoy. The product of our graduate programs is our most important asset as we plan for the future.

On the horizon, Dr. Webster sees "... a system of pharmaceutical education which has come to grips with the problems which professional neglect and educational indifference created and (which) has mapped out its course of action to overcome its shortcomings and insure its future growth." He sees on the horizon "... a substantial beginning towards a dynamic and creative professional education."

The professional pharmacist is noted as a person fitted to look upon himself as a co-worker in the health sciences, a man who is prepared to take his place naturally as a community leader, a man who will choose public good over expediency. These abilities and attributes will be the result of our educational program on the horizon.

THE MAKING OF A PROFESSIONAL

Dr. Benezet, in his paper "The Making of a Professional" set aside the labels "general" and "professional" as he depicted the education of the "American

professional man." He sees this American professional man in his full dimensions as "... the most important need of society today." But at his worst this man "... is our greatest liability." He holds the professional schools, and the supporting universities responsible for the right answer—this answer "largely depending upon his (the student's) preparation for and orientation to modern life."

The shortage of professional manpower is the result of the technological revolution, the full implications of which are not realized by the people or by government. Dr. Benezet sees the answer "... in making professional careers more attractive in terms of what it is that men live by." These terms include recognition from their fellowman and the resultant feeling of acceptance of their work. The image of the American professional man in the form of the quality of service performed must be such as to attract more young men and women into our professional programs. When the man is one to whom people turn for advice and inspiration (the latter being crucial), the image shines brightly.

In describing his version of the competent pharmacist, Dr. Benezet thinks of him first as a man who knows his business—a man who:

... will be successful first, to the extent he knows his business in the broadest terms, including human communications and ethics; second, to the extent he is an interesting human being, able to live with himself, and a successful family man and neighbor; and third, to the extent he is a citizen capable of contributing to solutions rather than problems in the vast muddle of world citizenship ahead.

The dimensions of this man must be shaped by our American universities through citizenship education in the professional curriculum. The inclusion of citizenship education might well be based on topics of interest to the professional student. Certainly it need not exclude such items as would illustrate the ethical concepts we wish to instill in the students for they must have "... the wisdom of ignorance and caution as well as of knowledge."

In considering the content of a program of citizenship education for the pharmacist, Dr. Benezet argues for courses in general and abnormal psychology, urban sociology, local and state government, business law, and a two year sequence in modern foreign language, the latter taught for direct communication. In making room for such courses, he suggests that pharmacy might ask itself the question: How much practical work should be attempted in the classroom in view of the wide variances in the field and the need for on-the-job training? There is a need for "liberalizing" courses in the later years of the curriculum when the student "... is better able to appreciate the side-roads of his education. ..." Such a program, he thinks would alleviate the condition whereby "... the specialist reproduces his own kind."

The use of single, isolated courses within a given area is discouraged inasmuch as there can be no continuity and harmony of spirit. However, the courses in the professional area can have a "liberalizing" effect if the professor will practice "... that spirit of broad education which should underscore every profession, and characterize the University in all its branches. ... In all education there must be training. ... But the nature of a graduate profession requires that in training there also be education. ... Training produces identical behavior; education produces new developments."

This objective can be achieved by the school and its students by utilizing the full resources of the university and not operating as an isolated unit, thus

discouraging the contact with other disciplines and the broadening effect of contact with other able minds.

GENERAL EDUCATION VALUES IN THE PHARMACY CURRICULUM

Turning to the pharmacy curriculum, Dr. Louis Busse discussed the educational values of our professional program. At the start he asked two questions: "How much, in the way of what is commonly referred to as 'general education,' can we afford to have in our professional curriculum?" Secondly, "What is our first responsibility to our students?"

He answered these in reverse order by stating that our programs must assure professional competence in our graduates. This is in accord with the thinking of Dr. Benezet and, I am sure, with that of the public we serve. This is our first obligation and it must not be prostituted.

Dr. Busse believes that "pharmacy's need . . . in terms of numbers of credits devoted to general education could be much less than the requirements of other professional curriculums." However, before making this statement he very ably points out that ". . . the curriculum is not a narrow, technological or scientific training." He emphasizes that the courses in physical and biological sciences help the student to understand the world about him and ". . . prepare him to understand and appreciate the whole new world we will be living in in the future. . . ." Later he states, "What is needed in pharmaceutical education is not just to introduce some 'arts' or 'humanities' courses into the pharmaceutical curriculum but is a broadening of the treatment and presentation of subject material at hand in order to have our students realize the full significance of their education and calling."

If general education is necessary, Dr. Busse believes, as does Dr. Benezet, that we should have general education with a purpose and not merely isolated courses. However, Dr. Busse believes that the student should have guidance in selecting his general educational electives while providing him some choice of the area.

Whereas Dr. Benezet advocates electives in the later years of the program, Dr. Busse for similar reasons gives thought to placing the "liberalizing" courses in the postgraduate years, through continuing education, when a more mature mind is available. Such a system would obviate the need of extending our professional programs in the years ahead when ". . . the battle for credits between technology and general education will be even more drawn than at present."

THE DELINEATION OF THE PROFESSIONAL DISCIPLINES

In his "Delineation of Professional Disciplines," Dr. Louis Zopf reiterated the words of Dr. Busse, namely, that "we are basically responsible for the preparation of a professionally competent person." But again, as did the previous speakers, Dr. Zopf recognized our obligation to expand the general educational qualifications of the student.

The fact that professional disciplines can not be sharply delineated, but are more appropriately considered as areas of responsibility was emphasized early in his address. This alone justifies the need for inter-disciplinary communication made possible through the seminars covering all areas of our curriculum.

A personal observation at this point would emphasize that should we ever

attempt a sharp delineation of each of the various disciplines and fail to give consideration to other areas as we view any given one, there would soon cease to be a "horizon of pharmaceutical education"; certainly, it would lose all breadth and depth.

Because of the lack of sharp delineation in our disciplines, Dr. Zopf asks that we "... recognize the necessity of compromise and the desirability of interdependence of all facets of the pharmaceutical curriculum toward the preparation of a competent pharmacist."

Following a review of recent definitions of "pharmacy," the professional courses of the curriculum were discussed and their value to the student in shaping his total education was presented. (It is pointed out that our most recently recognized discipline, pharmacy administration, was omitted. The relationship of this work to other disciplines might well have been included because of the legal and distributive concepts it provides.)

He closed his discussion with a most cogent observation relative to the boundaries of our disciplines: "When we secure the boundaries and become so selfish in our attitudes that we cannot yield to the principles of academic freedom, then we fail in two regards: we have not produced a qualified product, and we are not deserving of respect as academic individuals."

EDUCATION FOR DEPTH

Dr. Lawrence Coolidge, in his introductory remarks on "Education for Depth" stated that the word "professional" possesses no halo; the name alone does not provide the desired result but that man gets what he deserves. (This should serve to remind us that a law declaring pharmacy to be a profession does not make it so; it is how we as individuals and as a group conduct ourselves in the fullest sense, that causes it to be a profession.)

He urged that we reach a unified concept of professional education—one which includes general education. We must be interested in the processes of thought as engendered by liberal education. A professional education based on facts and not on broad principles leads to a deterioration of such an "education."

The professions must offer a high order of service as the public is not competent to judge. The end result of any crisis will depend upon the competence and quality of service which the professionals are capable of providing.

As to what constitutes a "liberalizing" of the professional education, Dr. Coolidge did not agree with previous speakers when he expressed opposition to too much concentration in one field because of the narrowness it produced. He did concur in the thought that professional courses can be liberalizing if they "educate for change"; if it focuses on people for the betterment of their lives.

It is significant that he noted that professional and liberal education should be thought of as a unit which will provide the kind of mental experiences we wish the student to have; we should think less of sharp divisions between the two educations.

SPECIALIZATION IN PHARMACEUTICAL EDUCATION

As the seminar progressed and with the attention given to general education in the pharmacy curriculum, it was only natural that the question should be

asked: What is wrong with specialization? Dr. Linwood Tice, in his discussion of "Specialization in Pharmaceutical Education," answered this question by stating that our schools of pharmacy have a responsibility of training specialists. He predicted that a decreasing percentage of our graduates will seek employment in retail pharmacy and that there will be an increased demand for our graduates by other fields of the profession. Our failure to provide personnel for areas other than retail has been harmful to the total profession as we recognize it.

As the result of a survey of some thirty to forty deans of our schools, the following conclusions were reached by Dr. Tice:

1. No specialization with depth is possible within the five year program without sacrificing some of the basic objectives of the undergraduate training.
2. Specialization attained at the expense of core subjects or general educational objectives is believed unwise and educationally unsound. The ambitions of some students permitted such a privilege may not be realized and thereupon may enter the retail field with inadequate preparation for such endeavor.
3. Professional or other electives in limited amounts which contribute to increased competence in some special field are acceptable providing they do not drop to the level of vocational training. Instances in which this might be permitted would include the selection of courses to expedite graduate training or of additional business courses by students interested in further information in this area.
4. Courses at the undergraduate level should be of academic stature and not attempt to achieve that which is best gained by in-service training.
5. The six year professional program and graduate programs are believed by most to provide the only satisfactory means for specialization with such depth as will be a credit to pharmaceutical education.

KEEPING UP TO DATE: THE RESPONSIBILITY OF THE PROFESSOR

The "Responsibility of the Professor in Keeping Up to Date" was discussed by Dr. Martin Barr. He stated that which all of us realize: that to keep up to date in an educational program which has as its objective the training of personnel for so many diverse fields as does pharmacy is indeed challenging and will become more so as we begin to instruct the more mature students enrolling under the five year program.

As teachers, we are charged with the responsibility of stimulating our students "... to the greatest fulfillment of their potential." While this may be accomplished in various ways in the case of different students, one manner is by keeping the student up to date in that area of the profession in which he has an interest. Thus, the teacher is challenged to keep up to date, if he wishes by "precept and example" to stimulate the student to think constructively and professionally.

In summary, Dr. Barr stated that teachers of pharmacy have the responsibility to direct more thought and more energy to a constant study of all matters

which pertain to pharmacy as a profession. They can fulfill their responsibility to their students, the pharmacists of tomorrow, only if they drop old concepts and accept the new and challenging points of view.

In the discussion that followed, it was pointed out that one way of keeping up to date was through Teachers' Seminars, held annually since 1949.

KEEPING UP TO DATE: RESPONSIBILITY OF THE ADMINISTRATOR

If the professor is challenged by keeping up to date, then the administrator is doubly challenged because he holds, in addition to his administrative title, the academic rank in question. This was borne out in the discussion of Dr. Harold Hewitt entitled "The Responsibility of the Administrator in Keeping Up to Date." Dr. Hewitt stated that the responsibility for the total educational program of the school or college of pharmacy rests with the administrator—a responsibility which cannot be accomplished successfully unless he keeps up to date. He believes that this is largely a matter of maintaining good communications between administrator and his constituency, be it faculty, student body, practicing pharmacists, or the public. Inadequate communication is usually at the base of all misunderstanding.

In his comprehensive discussion, Dr. Hewitt characterized the administrator, outlined his responsibilities, considered the factors involved in the selection of a staff member, discussed the promotion of faculty members, expressed his views on quality training, told of his concept of the administrator's responsibility to the student both as a student and as an individual, and discussed the climate for research.

Dr. Hewitt, in emphasizing the importance of good communications as a responsibility of the administrator, stated that he was thinking of "... a united effort where persons or groups face a problem or experience together," not the mere supplying of information through the usual media. Communication should include "... the sincere effort of the administration to listen to, and to understand the other staff members' ideas or their interpretation of the problem."

In discussing the promotion of staff members, Dr. Hewitt emphasized the importance of keeping up to date with the activities of the staff. He spoke of the importance of excellence in teaching and of research activities, but stated that "... superior field service and other public relations responsibilities (of the staff) cannot be overlooked."

With the advent of increased student enrollments in the years ahead, he outlined the responsibility of the administrator in maintaining quality training. Unless the size of classes is correct in each instance, he mentions the unhappy prospect of losing the gifted and superior student because he does not receive the challenge he expects. (If this happens we negate the efforts of a quality recruitment program.) In addition to controlling the size of classes, Dr. Hewitt states that we should assign our best teachers to the first-year students, design the curriculum "... to challenge our students' scientific curiosity ...", and develop in the student "... a curiosity about other basic disciplines. ..."

The administrator's responsibility to the student and the importance of good communications with him and, to the extent possible, with the student's parents, were stressed by Dr. Hewitt. He said, "Intelligent counselling is an essential adjunct to good teaching. Impersonal handling of our students may result in failure to recognize his dignity as a student or his integrity as a scholar." He

stressed the importance of personal interviews with prospective students and the valuable opportunity thus provided for communication with the parent of the prospective student.

The need for a favorable intellectual climate for graduate and research work was described as "paramount." Cognizance of the conditions which favor growth in this area is one of the responsibilities of the administrator, Dr. Hewitt stressed. "While the ideas and initiative for research must come from the staff member, every encouragement should be given by the administrator," he said. The graduate student-professor ratio is of prime importance and he stated that at his college a ratio of five graduate students to each professor had been established.

In respect to the adequacy of our graduate programs for preparing candidates for teaching and for research, Dr. Hewitt expressed his opinion that "... the average Ph.D. program is not adequate for teacher training and it is doubtful whether it meets the demand for many of the governmental and industrial positions." He advised a re-examination of our programs "... in light of the demands of those who employ our trainees." Thinking of the importance of broadly educated persons, he stated that if we are not developing personnel "... capable of exercising initiative, imagination and wisdom in dealing with complex problems ... we should look less to credit requirements and more to the type of program which recognizes, not only the professional development, but also that of the individual who must be a member of a professional family who can join in the activities of the organization."

FUNCTION OF THE LIBRARY AND LIBRARIAN

Dr. Ralph Ellsworth discussed "The Function of the Library in Keeping Up to Date." He pointed out that the librarian has the following functions:

1. To provide the professor with the research information he needs. This requires knowledge of the work and the interest of the individual researcher and will require an increased library staff and a more rapid means of communication. To this end the printing of individual articles as soon as presented for publication was suggested, with the bound journal serving its usual role in the library. That present methods of communication cannot be continued in view of the volume of research being conducted, was strongly emphasized.
2. To provide pharmacy with direct access to supporting literature in chemistry and medicine. This is a serious problem in existing schools and will become more serious as new schools seek a library of unobtainable journals. To overcome this problem, and that mentioned under item 1, several new methods of communication and of providing literature from journals in limited supply were presented.
3. To stimulate the use of the literature; in the case of the pharmacist to encourage reading in the non-scientific area. This is an attempt at the "liberalizing" effect. Here the librarian can suggest reading habits, e.g., reading "opposites"—views opposite to those encountered in the popular weekly news issues. Dr. Ellsworth

emphasized that we are not exciting our students sufficiently in the ways of the world; especially is this true in the scientific disciplines.

TRENDS IN GRADUATE EDUCATION

Dr. McKean, Dean, Graduate School, University of Colorado, outlined what he considers as the trends in graduate education. Briefly, these include the following:

1. Because of the vast mass of knowledge accumulated through the years, an increasing number of years of graduate study is essential and specialization is becoming increasingly necessary.
2. The apprenticeship type of postgraduate training is diminishing; there is a decrease of such programs in industry. The trend is to Ph.D. training in universities and then employment.

While at the turn of the century 70-80 per cent of those with Doctor of Philosophy degrees were in colleges, men with such training are now distributed widely with only a slight majority in our colleges. As this trend continues, perhaps graduate training should be directed more for employment outside of our colleges than for teaching careers.

3. There is a trend toward increased professionalization of graduate education as the Ph.D. degree becomes increasingly essential for employment in industry. There is even a tendency to identify the special area of training with a given discipline.
4. While an increased enrollment in graduate schools may be expected, higher admission standards may slow down this trend. Although increased financial support is clearly observable, it does not meet the need. The Woodrow Wilson Fellowships were cited as was the trend for allowances for dependents.
5. There is a trend towards an annual increase in tuition fees for graduate study. Dr. McKean deplored such increases when they are used to discourage attendance from non-resident students, the end result of which is excessive inbreeding. He also deplored any tendency to use teaching fellows to help carry heavy teaching schedules at low cost, such programs being even more reprehensible in view of the fact that no more than one-half of all graduates will remain in teaching. He stated that the effects of such programs on the undergraduate program are appalling.
6. There is a gradual but somewhat uncertain trend toward the accreditation of graduate programs as a separate unit of the institution. While most professional groups stop with the accreditation of undergraduate programs, there may be a slow trend to giving increased attention to the qualifications of the teachers, and to facilities. Dr. McKean advised institutions to make allies of accrediting groups and to use them as outside evaluators to gain the advantage of an improved program.

In summary, Dr. McKean advised that the trends must be carefully observed as graduate education is "fluid." He feels that college education may be in for a down grading—the Ph.D. degree becoming the equivalent of an M.S.

and the M.S. the equivalent of a B.S. degree because of the lack of personnel and the competition from outside employment.

GRADUATE EDUCATION IN SCHOOLS OF PHARMACY

Dr. Melvin W. Green in his address on "Graduate Education in Schools of Pharmacy" noted that the first Ph.D. in pharmaceutical science was granted in 1902 by the University of Wisconsin. Current figures show that this degree is now offered, in one or more areas of the curriculum, by thirty-five schools with fifty-two schools offering the master's degree in one or more fields. A total of 872 students were enrolled in graduate programs of our colleges during 1959-60.

While recognizing the challenging task our schools face in the training of undergraduate students, the advantages of graduate programs, not only to the individual schools but to the profession as a whole, were enumerated. The important work of the American Foundation for Pharmaceutical Education in fostering graduate work in the profession was emphasized.

Dr. Green enumerated a number of problems to be faced in the operation of quality graduate programs. These include the following:

1. Recruitment of students.
2. Financial assistance for both students and the programs.
3. The program itself which provides a "constellation of problems."
4. Teacher preparation.
5. The need for self-study.

In spite of the largest enrollment of graduate students in the history of pharmaceutical education, we need additional students, not merely because we have the space but because of the opportunities for employment. While stressing the need for numbers he gave even greater attention to quality.

Pharmacy is not alone in its failure to attract more able students, and in reviewing causes for this failure, he referred to reasons enumerated by President Harold Taylor of Sarah Lawrence College. Among these reasons is the public image of the profession. Here reference was made to the currently unfavorable image of the scientist and the teacher. Another reason is the educational system itself. To offset the force of our contemporary society as it shapes the ambitions of youth, our schools and colleges must serve as models of the significance of intellectual life and its achievements.

Dr. Green emphasized the need for quality in graduate students by quoting Dr. Taylor as follows: "It is clear that unless we have in our graduate schools a large proportion of the most talented of the younger generation, we will not be able to develop the imagination and the intellectual energies of the country to a sufficient level to meet the social and cultural challenges of the future." Certainly this is as applicable to our profession as it is to the teaching profession *per se*. As Dr. Green stated, "The recruitment of the most able youth for graduate training is one activity for which there must be no relaxation if pharmacy is to continue to progress."

Improved financial assistance is one factor which would enable pharmacy to attract the best talent from its classes. Dr. Green stated that we need "... money for more fellowships and money for greater individual stipends."

While reviewing the support received by our programs from outside sources,

he stated that this amount "is far too small when compared to other professional schools and even single science departments."

With respect to the program itself, Dr. Green emphasized the need for "strong courses in the basic science areas and competition with non-pharmacy graduates." Depending on the area of study, "strong courses in mathematics, physical chemistry, physics, chemistry, physiology, bacteriology and other related sciences are essential."

He feels that we have almost completely neglected the sociologic side of pharmacy. In view of increasing socialization of the health professions, Dr. Green stated that "self-preservation demands that we understand our position in such a changing environment and that we have the facts when they are needed." Pharmacy administration can help in this area "if it sets its research sights above the area of day-to-day pharmacy retail economics up to the realm of the economics of pharmacy's professional position among the health professions."

The need for teacher preparation within our graduate programs was emphasized stating that training for this special role is "almost non-existent." He quoted the Committee of Fifteen established by the Fund for the Advancement of Education, to emphasize this important point. Included were these statements: "Graduate schools . . . are at present not paying sufficient attention to a function they inherited by a natural historical process—that of providing effective training for college and high school teaching"; and, ". . . it should become the avowed purpose of graduate education to produce more people who are neither mere scholars nor unscholarly teachers but scholar-teachers."

After discussing this final area of graduate problems, Dr. Green called for a "thorough self-study." He thinks the "goals of (pharmacy's) graduate programs need to be restudied and, more particularly, the ways they are met and the degree of success in their attainment." With respect to students, he expressed a need for an "appraisal of research competence, . . . of ability to teach, . . . of ability to supervise others and to cooperate professionally, and the appraisal of their professional ethics."

The media of such a self-study might include the graduate alumni, research directors and supervisors in industry, and academic employers of the schools' graduates.

Dr. Green stated, and I am sure we all agree, that "there is no more important phase of pharmaceutical education than the graduate program."

RELATIONSHIPS BETWEEN UNDERGRADUATE AND GRADUATE EDUCATION IN PHARMACY

A problem, in the minds of some, arising with the extension of the undergraduate program, was discussed by Dr. Glenn L. Jenkins in his address on "Relationships Between Undergraduate and Graduate Education in Pharmacy." Dr. Jenkins stated the problem and his position clearly in his introductory remarks when he stated, "Basically, any system of extended professional education and graduate education is incompatible." He then proceeded to set forth "certain guide lines pertinent to integration" of the two programs.

In discussing the "time element," he recognized the need for an "expanded strength of education in professional, as well as non-professional, areas." Medicine, dentistry, engineering, and education, as well as pharmacy, are con-

fronted with this problem. Dr. Jenkins cited the efforts of some engineering schools to alleviate the situation by permitting superior students to complete the M.S. degree in five to five and one-half years.

From the standpoint of attracting the more able students into our graduate schools, Dr. Jenkins stated, "The time period of the undergraduate curriculum in pharmacy is incompatible with the recruiting of talented youth for graduate work." He recommended "differential treatment for different levels of ability" if "we are serious about advancing graduate work and helping each individual to develop his potentialities to the utmost." Acceleration through the use of advanced placement programs as offered by some high schools and the trimester program were outlined as media of providing differential treatment. An additional medium within the five year curriculum would be to establish high-level courses for superior students or to permit them to carry additional courses.

In presenting the faculty's place in this problem, he discussed the "incompatibility between undergraduate and graduate instruction." In discussing the classical concept of the value of teaching versus research in our programs, he did not suggest that "there is a negative correlation between effective teaching and research, but only that positive correlation is often lacking." Of paramount importance in scholarly motivation is the teacher who places "a high value on intellectual achievement." If the teacher has a "zeal for teaching and a genuine respect for excellence," Dr. Jenkins said that "he will accomplish more to advance the cause of pharmaceutical science than by performing research." He recognized, however, that it is "research that gives the teacher something to teach, and without the teacher's support, research would die for the lack of trained workers."

In concluding this discussion, Dr. Jenkins returned to the basic concept that "scholarly teaching and sound research must be kept in balance and advanced in accordance with the resources of each school."

Holding to the title of his address, namely "Relationships Between Undergraduate and Graduate Education in Pharmacy," Dr. Jenkins, after reiterating the "incompatibility between the extended program . . . and the recruitment of well-qualified graduate students," argued for graduate students with an undergraduate background in pharmacy because otherwise "he will not bring advancement and prestige to our profession and promote its eminence in science."

In discussing the use of graduate students as teaching assistants, he believes that we have "a real opportunity to integrate undergraduate and graduate instruction." While stating that "appointments to graduate teaching assistantships should be reserved for graduate students who really want to learn about college-level teaching," he recognized that "practically all graduate students, even though they enter industry and research after completing their advanced degrees, engage in a teaching function in handling people, instructing subordinates, presenting seminars, and in other ways."

"The more closely the professional and graduate work are intermingled in a physical sense, the better the environment for scholarly achievement," said Dr. Jenkins. Accordingly, he prefers a system whereby "faculty offices, the laboratories, the equipment, and the research space for any given area of instruction form a compact unit" rather than a separate research wing or building.

The task of the administrator in the integration of the graduate and undergraduate programs is "to prevent encroachment on the professional instruction by research" if "the prime function of a college of pharmacy is to prepare

professionals for competency in practice and service to our citizens." Recognition of the abilities of faculty members with respect to teaching and research is a mark of good administration. A spirit of teamwork among staff members with varying abilities and interests in these two categories is conducive to good results.

In concluding his address, Dr. Jenkins offered what he views as the "most logical plan to accomplish our educational advancement." Such a program would provide for:

(1) An integrated four-year undergraduate course of liberal and professional education with opportunity for acceleration by the talented, leading to the baccalaureate degree. . . ; (2) a period of specialization for those who want to enter general or professional practice and require one or more years for a professional degree and licensure to practice; (3) the admission to graduate work of qualified and talented graduates with the baccalaureate degree. . . .

EFFECTS OF THE TEACHERS' SEMINARS ON UNDERGRADUATE EDUCATION

"The Effect of the Teachers Seminars on Undergraduate Education" was presented by Dr. Joseph B. Sprowls. To determine what effect had resulted, he circulated questionnaires to teachers of each discipline using recommendations made or subjects emphasized at the seminars in their particular discipline as a means of measurement.

In summarizing the results of his efforts, Dr. Sprowls stated that "the greatest value of the seminars may be expressed in terms of personal values to teachers." Heading the list of these values was the "exchange of ideas and information" with "suggestions for improvement of teaching methods," "suggestions for curriculum revision," "comparison of methods with others," and, "evaluation of methods presently used" following in that order.

Although the Teachers' Seminars were not specifically intended to serve as discussion forums of the curriculum or its planning, Dr. Sprowls found that "curricular changes have occurred as a result of seminar influence." In this respect, the following were mentioned:

1. Pharmacy—widespread adoption of courses in physical pharmacy and orientation.
2. Pharmacy Administration—encouragement of the adoption of courses in principles of economics and an increase in the amount of instruction in pharmacy administration.

Another value of the Seminars was found to be the underlining of trends of instruction already apparent. This influence has been beneficial "since it served to confirm trends of thought and encourage unification of action in course adoptions." Some of these trends recognized were: the combining of general and qualitative chemistry; adoption of courses in instrumental analysis and radioisotopes; increased instruction (especially laboratory) in physiology and biochemistry.

Dr. Sprowls expressed the thought that much more could be accomplished in determining the achievements and failures of the Seminars and that such information would be beneficial for planning future meetings.

Throughout the four-day seminar, an occasional note was sounded regarding manpower for pharmacy. Dr. Glenn Jenkins referred to it early in the week when he stated that we cannot forget the importance of the distributive functions of the profession and that manpower must be provided for this service. Dr. Busse in his address, and others in discussion, reminded us of our obligation to

furnish competent professional personnel and that we cannot leave it to the public as a whole to decide the degree of competence a pharmacist should have as this is the profession's responsibility.

Certainly the horizon of retail pharmacy is darkening, and we may have an even greater eclipse before there is improvement. We must continue to attempt to solve, or at least improve, this picture. As was pointed out this morning, some of our best young minds must be directed into this area as well as into graduate programs. Pharmacy must not permit other groups to "solve" our problem in retail pharmacy. To do this would be a serious mistake. While compromise may be necessary, let us not make it to the detriment of the health of those whom we serve.

RECOMMENDATIONS FOR THE FUTURE

Although in my greetings at the beginning of the seminar suggestions on the new pattern for the annual meetings and the seminar were requested, nothing specific was received. However, at the request of the Council on Conference of Teachers, the Association's Executive Committee has agreed to meetings of the sections of teachers at the 1961 annual meeting.

During the annual convention this week, it was decided that a full discussion should be held in 1961 on the pattern approved in 1960, i.e., a general seminar every three years held with the annual meeting on a university campus and on the intervening years, a seminar in a separate discipline with the annual meeting (but no meetings of sections of teachers) held with the American Pharmaceutical Association meeting. Thus, the April, 1961 meeting will provide opportunity for everyone to offer their proposals for what is deemed the most desirable pattern.

In view of this action, recommendations for future seminars may be somewhat out of order at this time. However, one thought has presented itself as a result of the seminar this week. It stems from the address of Dr. Zopf in which he stated that the areas of the pharmacy curriculum cannot be sharply delineated but are more appropriately considered as areas of responsibility. This certainly emphasizes the need for general seminars, such as this, where teachers of all disciplines can meet and give consideration to the total program as well as to their "area of responsibility."

On this basis, we might give consideration to holding general seminars (of five or six days' duration) every two or three years, eliminating seminars in the separate disciplines. The annual business meeting would be held separate from the seminar and with the annual meeting of the American Pharmaceutical Association. The sections of teachers would be held annually with the business meeting, perhaps with more time for meetings and with a separate section for each of the five areas of the curriculum.

ATTENDANCE

The prepared registration list of seminarians at this twelfth seminar gives the names of 170 persons exclusive of some five from the University of Colorado who, while meeting our needs during the week, may have found some time to attend the daily sessions.

That this has been a successful seminar is not denied. I am confident the next survey made to determine the effect of the seminars on our programs will find that this third general seminar has made a definite contribution. As was stated this week during our discussions on the worth of the seminars, "while often intangible, through the years the value is readily apparent."

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